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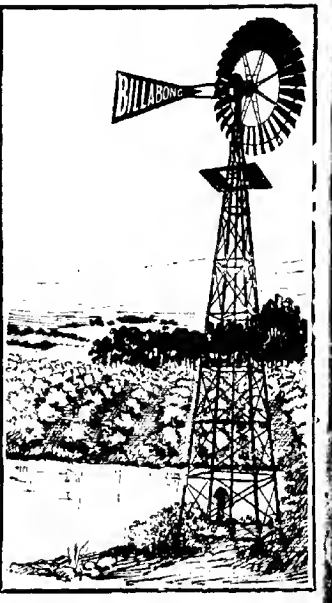
On Active Service



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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

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GOVERNMENT COOL STORES, VICTORIA DOCK, MELBOURNE.

By R. Crowe, Exports Superintendent.

The new Government Cool Stores, Victoria Dock, Melbourne, were officially opened by His Excellency the Governor, Sir Arthur L. Stanley, K.C.M.G., on Wednesday, 23rd September last. In many respects these stores are unique, as they differ materially from all other freezing works. Most places of the kind are designed to suit the requirements of some special class of business, and nearly all the freezing works in Australasia have been planned to cater for the wants of the meat export trade, whilst these stores have been constructed to meet the particular needs of the trade conducted by the Victorian Department of Agriculture. The handling and freezing of butter for export form a leading feature of the business. Meat comes next in point of importance; then follow poultry, rabbits and hares; and fruit is also provided for.

On the 14th November, 1914, there were stored in the new works 116,397 packages of perishable produce, representing a value of about £150,000.

Already Fully Justified.

Had the stores not been in existence this season, the equivalent of produce referred to would have been sacrificed, as all other freezing works in the State were taxed to their utmost through the want of shipping that was encountered in consequence of the war. Important as this aspect of the situation is, it sinks into insignificance when compared with the loss which producers of the State would have sustained had freezing space been restricted by 150,000 or 200,000 carcasses. It can be asserted that, but for the new Government Cool Stores this season, the market in Victoria for lambs, sheep, and beef cattle would have been lower than it was, and producers would have suffered to the extent of shillings per head. From a national point of view, therefore, the stores

have already been amply justified by affording producers fuller prices for their stock than they would otherwise have been able to obtain.

BRIEF HISTORY.

In the year 1888 the Government of the day, finding the producers of the State in a bad position, put aside a large sum of money for the purpose of encouraging and developing an export trade in perishable products. For some years prior to that period, the price of butter used to go down to 3d. per lb. during the spring months; there was no outlet for surplus sheep excepting through the boiling-down plants, where they were converted into tallow; it was a common practice to destroy and bury pigs every alternate year or so. Generally, the requirements of the local demand were too limited, and, when exceeded, the prices of most farm products came down to an unpayable level. The prospect of the producer was, therefore, anything but bright. Consequent, however,

General View of Cool Stores, Victoria Dock, Melbourne.

upon the advent of bounses, a fillip was given to production on lines calculated to meet the requirements of an export trade. When surplus butter came forward for shipment, it was recognised that it had to be cooled prior to export. As there was a freezing works standing idle at Newport on Government property, an arrangement was made with the owners, and possession taken. In a couple of years' time this place was found inconveniently situated and expensive to work.

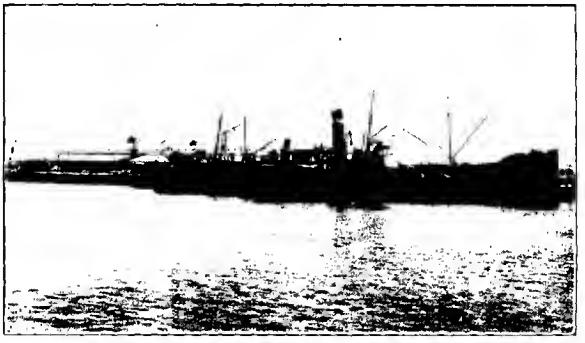
A portion of the insulated accommodation provided at the new City Markets was then leased from the municipality of Melbourne. Before the end of the year the whole of the space there was occupied for promoting the export trade.

Up to the 30th of June, 1914, produce to the value of £27,000,000 had been treated for export at the cool stores managed by the Government since the inception of the trade. For the latter period of the lease - 1901 to 1908—the rent, including the use of the machinery, paid by the

Government as tenants of the Melbourne City Corporation amounted to £15,000 per annum, since when the rent has been over £15,000 yearly. This amount was considered excessive, and it being also recognised that the produce of the country required more up-to-date and efficient treatment, the Government decided to erect stores of their own.

SITUATION OF STORES.

In selecting a site and planning the works, the cumulative experience of twenty-five years was brought to bear on the subject. Hitherto delays had been encountered in getting produce conveyed from the railway terminus into the old stores. Hence the site for the new works was selected as close in to the hub of the State railway system as it was possible to get. All trucks containing produce coming forward to Melbourne, whether by goods or mixed trains, are disbanded in the gravitation yard. In this way all trucks containing produce for export are shunted on to one line, whilst those having produce for both local



View of Government Cool Stores from Victoria Dock.

sale and export go into the railway perishable depôt. After the goods for local requirements had been unloaded, the practice was, under the old *regime*, to transfer the contents of the partially-empty trucks into other similar ones, and then shunt out the empties. These operations involved an appreciable amount of labour, time, and exposure of the produce. Transferring and shunting can now be greatly reduced.

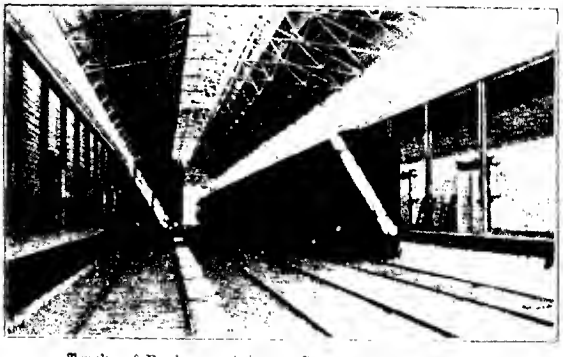
RAILWAY FACILITIES.

At the new site three railway lines serve the inside of the building, the centre one for shunting, whilst two other lines cater for the outside platform. The three platforms total 1,320 feet, so that loading and unloading at several points may be proceeding simultaneously without disturbance from traffic operations, the main consideration being to have the goods delivered into the stores at the earliest possible moment after reaching their destination.

DELIVERY ON TO STEAMERS.

The next great consideration was to have the stores located conveniently for shipping. There are for Melbourne three principal export centres:—Port Melbourne, from which most of the butter has been shipped; Williamstown, where the great bulk of the meat and fruit is loaded; and the export wharf of the Victoria Dock. The Victoria Dock has been steadily growing in favour, and each year an increasing quantity of produce is placed on shipboard there. The further Harbor Trust improvements recently decided upon provide for another dock on the north side of Dudley-street. The new stores will, therefore, be on a sort of peninsula, having streets and wharfs on either side, with overhead connexions both ways to the waterside.

It is not expected that the mail steamers or old type of Liverpool White Star boats will come up to the Victoria Dock for perishable goods; but it is anticipated that, when sufficient inducement offers, the other



Trucks of Produce arriving at Government Cool Stores.

overseas steamers will come into the dock for loading direct from the stores. The use of insulated barges for boats lying at Williamstown and Port Melbourne is under consideration.

FOUNDATIONS.

The site upon which the stores are erected comprises reclaimed swamp land, and consists entirely of silt. Foundations of the usual character were consequently impracticable. Reinforced concrete rafts were, therefore, laid down on the surface for each block of buildings. The rafts are 9 inches thick, and were designed to carry a load of 6 cwt. to the superficial foot. They have been tested up to over 25 per cent. of that weight without deflection. From a sanitary point of view also these rafts form an ideal foundation.

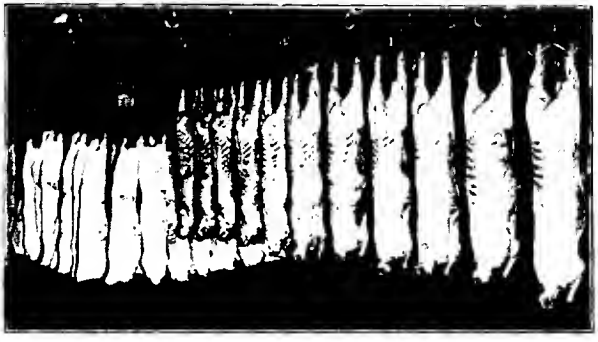
Instead of excavating holes in the ground and putting down concrete foundations for the machinery, the foundations were placed on top of the raft. This plan necessitated the erection of a second floor to bring the operators up to a level with their work.

BUILDINGS.

The buildings consist of timber and galvanized iron, and owing to the nature of the foundations only one story in height. From a refrigerating engineer's stand-point this form of building will be considered wasteful on account of the large outer surfaces over the space insulated, but for the class of business which the Department is engaged in there are redeeming features, such as facilities for handling large quantities of various kinds of produce in and out at the one time, which go to counterbalance the objection referred to. The area roofed in is about 2¼ acres.

CHAMBERS.

There are twenty-nine freezing chambers in the building altogether, three being piped for long storage goods and experimental purposes. All the other chambers are served by air circulation. The fifteen butter chambers are capable of holding 80 tons each, or a total of 1,200 tons. Eight chambers of uniform size are designed to hang 1,000



Meat Freezing Chamber, Government Cool Stores.

carcasses at a time, and seven of these are already fitted up with hangers, whilst there are four special storage chambers, the largest of which can hold over 12,000 carcasses of lamb at a time. The two experimental chambers will be used for solving problems, particularly in connexion with the storage of different kinds of fruits, &c. There are factors still to be settled besides that of temperature, such as humidity, air circulation, ventilation, &c.

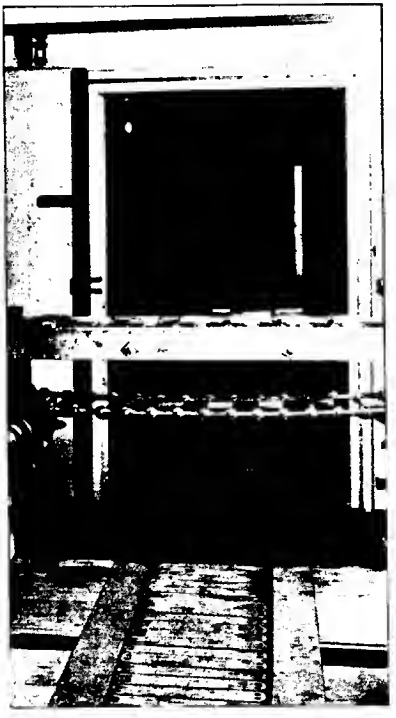
Were the whole of the chambers devoted to the storage of one product, they are capable of holding 155,000 boxes of butter, or 105,000 cases of fruit, or 110,000 carcasses of lamb and mutton.

INSULATION.

All floors, ceilings, and outer insulated walls are filled with pumice, partitions with machine wood shavings, and doors with granulated cork. Over 1,000 tons of insulation, chiefly pumice, were required. There are 310,000 cubic feet insulated. The ammonia piping connexions to batteries are insulated with hair felt covered with canvas, and painted.

BATTERIES AND AIR SERVICE.

The batteries in the seven coolers are each made up of 9,000 feet of 1¼ inches diameter welded ammonia piping, and provided with a 7 feet diameter fan. A system of baffles and valves in the supply and return air ducts enables the quantity of air to be regulated to suit the different varieties of produce being treated. It is also possible to divide all the chambers into sets of two or more to be independently served, and, on the other hand, one battery only may be used for all the chambers connected. For instance, when meat, fruit, and butter are requiring independent air



Conveyor to Butter-grading Room, Government Cool Stores.

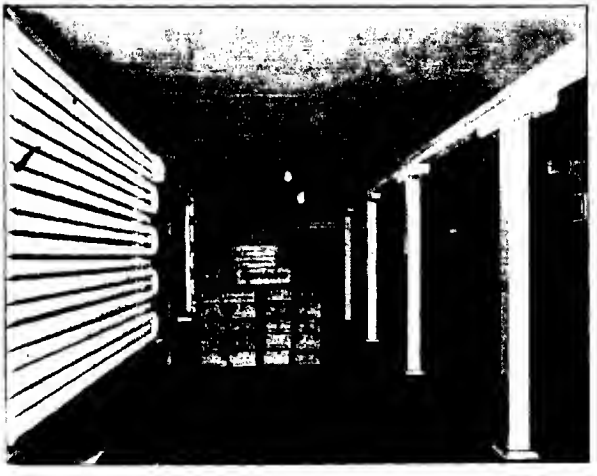
services and temperatures, different batteries are employed respectively; at another time of the year all the chambers in question may be utilized for fruit storage, and then one battery can be made to serve the lot.

TEMPERATURES.

An electric temperature recorder connects each chamber with the engine-room, where the temperatures are looked up hourly. The touching of a key indicates the temperature of any chamber in the engine-room instantly; thus the temperatures are under absolute control without

incurring the usual waste by opening chamber doors, and the labour involved thereby. The temperatures and best method of freezing each class of produce are carefully applied. For instance, the experience

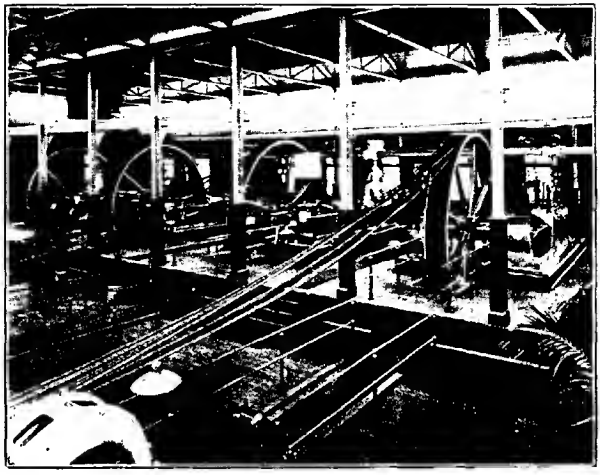
Grading Butter, Government Cool Stores.



Experimental Chamber, Government Cool Stores.

acquired during a quarter of a century, together with careful experiments conducted from time to time, have proved that the lower the temperature at which butter is maintained, the less the deterioration in storage.

Hitherto, the contract for the oversea carriage of butter provided that the temperature was not to exceed 30 degrees at time of shipment, and

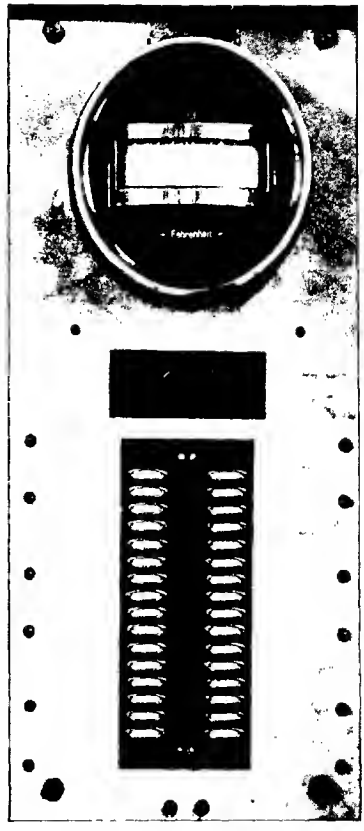


Machinery Room, Government Cool Stores.

Ammonia Condensers, Government Cool Stores (18 miles of piping installed throughout works).

much lower than this temperature was not aimed at. The new Government Cool Stores are designed to reduce the temperature of butter much

faster, and to a lower degree than has been enjoyed by Victorian exporters in the past. Engineers of shipping companies usually check the temperatures of numbers of boxes at ship's side, and in this way fifty-eight brands of butter shipped by R.M.S. *Medina* on the 17th November showed a temperature ranging from 19 to 22 degrees Fahr., or an average of 21.17, whilst twenty-two boxes from other works similarly checked ranged from 25 to 29 degrees Fahr., or an average of 27 degrees. It is obvious, therefore, that butter shipped and carried at the lower temperature will reach its destination in better condition.



Electric Temperature Indicator, Government Cool Stores.

Machinery.

All the machinery in the engine-room was made in Melbourne—Ammonia compressors by J. B. Werner and Company Proprietary Limited, Burnley-street, Richmond; electric motors by G. Weymouth Proprietary Limited, Neptune-street, Richmond; and the driving ropes by Messrs. James Miller and Company, Whitehall-street, Yarraville. The ammonia compressors have each a capacity of 100 tons refrigeration per twenty-four hours, giving a total of 400 tons, whilst the electric motors are 150 horse-power each.

There are in the building altogether twenty-four electric motors, totalling 820 horse-power. The installation of four separate uniform units enables the work to be catered for as required. At a slack time of the year the running of one machine will be sufficient. When more produce is coming forward a second can be started, and so on. The possibility of breakdown is also guarded against, as it is most improbable that two machines would fail in the one respect at the same time. All the parts in each machine are interchangeable, and the very latest and most up-to-date details have been embodied in the plant

POWER.

The current is supplied by the Melbourne City Council, but when the electrification of the Melbourne suburban railways is in full swing the current will be obtained from the Railway Department's power-house.

CONDENSERS.

The ammonia condensing plant is erected in a separate building, and rests on a reinforced concrete tank. The condensers, like the compressors, are in four units. Each combination is capable of being operated singly or coupled into two or three units, or employed as a whole. The condenser contains upwards of 18,000 feet of 2-inch ammonia piping tested up to 300 lbs.; the water supply is 75,000 gallons per hour, pumped from the Victoria Dock. The whole is electrically driven by two 15 horse-power motors direct coupled to the circulating pumps. Between the condenser, batteries, pipe chambers, and connexions there are altogether over 18 miles of piping installed.

CONVEYORS.

The mechanical conveyors are nearly 5,000 feet long. Doubled as they are for working, the length in action would be nearly 2,500 feet. Produce can be placed on conveyors at any point, and mechanically carried to any chamber in the building, or from any chamber into the hands of men stowing in ship's hold.

Even if workmen washed their hands hourly, packages would become more or less stained with frequent handling; in addition, packages get knocked about, and a percentage is damaged by repeated handlings. Mechanical conveyors will obviate both breakage and disfigurement of goods, and, of course, save a good deal of labour and expense.

SODIUM CHLORIDE (COMMON SALT) USED AS A MANURE.

The use of sodium chloride as a manure has been largely abandoned since it became known that neither sodium nor chlorine (the elements constituting this compound) were essential plant foods, yet recent experiments in Sweden, conducted by Professor H. C. Söderbaum, Director of the Chemical Section of the Swedish Central Experimental Station, have yielded encouraging results.

The experimenter found that sodium chloride affected the various crops differently, and concludes that applications of common salt might frequently replace potash dressings with advantage, especially in the case of root crops (mangolds in particular), and that the beneficial effect is due to the chlorine content or some other factor, and not its sodium content. Extract from *Fertilizers*, 25th June, 1914.

THE ARTIFICIAL MANURES ACTS.

UNIT VALUES FOR 1915.

By P. Rankin Scott, Chemist for Agriculture.

The amending Artificial Manures Act of 1910 requires that manufacturers or importers shall, on or before the 1st November in each year, register the brand of the several fertilizers, and at the same time supply to the Secretary for Agriculture, under declaration, the name and address of manufacturer or importer, the place of manufacture, the raw material from which the manure is manufactured or prepared, a statement of the percentages of nitrogen, phosphoric acid, and potash, together with the respective forms in which they occur, and the retail price per ton. From the information so obtained the unit values of the constituents which have a commercial value are calculated. These unit values so obtained constitute the basis of calculating the values of all manures for the period during which the registered brands continue in force, *i.e.*, until the publication in the *Government Gazette* of the list of registered brands for the following season.

A fixed limit of deficiency is allowed in all fertilizers. (See Schedule hereunder.)

When a manure on analysis is shown to contain less nitrogen, phosphoric acid, or potash than the proportions stated on the label or invoice certificate, to the extent set forth in the Schedule the vendor is liable to a fine of £10 for a first offence, and £50 for any subsequent offence.

SCHEDULE.

Description of Manure.	Percentage of Deficiency allowed in regard to Ingredients of Fertilizing Value.				
	Nitrogen.	Potash readily soluble.	Phosphoric Acid.		
			Water soluble.	Citrate soluble.	Citrate insoluble.
All manures containing Nitrogen	10·50				
All manures containing Potash		1·00			
All manures containing Water Soluble Phosphoric Acid			1·00		
All manures containing Citrate Soluble Phosphoric Acid				1·00	
All manures containing Citrate Insoluble Phosphoric Acid					1·00

NOTE.—Provided that the total phosphoric acid deficiency shall not exceed 1·50 per cent.

Regarding the label and invoice certificate referred to above, sections 5 and 7 of the principal Artificial Manures Act of 1904 stipulate that the vendor shall attach to each bag a label or tag declaring the

composition of the manure, and shall deliver to all purchasers of manure, at the time of sale, an invoice certificate, conveying similar information to that required to be stated on the label.

From the unit values and the guarantee contained on the tags or invoice certificates, it can be readily ascertained (see method of calculation) whether the price asked for a fertilizer is a reasonable one.

In basing a valuation on mixed manures, by this method of calculation, the price asked generally exceeds the commercial value of the fertilizing ingredients contained in them, the increased cost of these mixed manures represents the cost of mixing, bagging, &c.

THE VALUATION OF MANURES FROM ANALYSIS.

The commercial value of a manure can be ascertained by multiplying the percentage of the nitrogen, phosphoric acid or potash content, as stated on the tag or invoice certificate, by the unit value fixed for the ingredient according to the form in which it occurs in the manure.

As for example, bonedust should have a label affixed to the bag stating the total percentage of nitrogen and phosphoric acid together with the percentage of fine and coarse bone guaranteed in the manure.

Now, as no two bonedusts contain the same percentage of these ingredients, the following example will demonstrate how to calculate the correct commercial value per ton—

Bonedust—	
Nitrogen	3.75 per cent.
Phosphoric acid	21.50 "
Mechanical condition	
Fine bone	12.50 "
Coarse bone	33.00 "

The unit values of these ingredients as fixed for the year, as contained in the table, showing same, is:—

Nitrogen, as fine bone	£0 15 0 per unit.
Nitrogen, as coarse bone	0 13 0 "
Phosphoric acid, as fine bone	0 4 6 "
Phosphoric acid, as coarse bone	0 3 6 "

First determine the proportion of nitrogen as fine bone by multiplying the percentage of nitrogen by the percentage of fine bone and dividing by 100—as for example—

$$\frac{3.75 \times 42.5}{100} = 1.59 \text{ per cent. of fine bone.}$$

The other ingredients are estimated in a similar manner according to the percentage as stated on the tag: consequently this particular bonedust results as follows:—

Nitrogen, in fine bone	1.59 per cent.
Nitrogen in coarse bone	2.16 "
Phosphoric acid in fine bone	9.14 "
Phosphoric acid in coarse bone	12.36 "

To determine the commercial value per ton, multiply the percentage amount of each ingredient by the unit value for same, as follows:—

Nitrogen, as fine bone	1.59 × £0 15 0 ...	£1	3 10
Nitrogen, as coarse bone	2.16 × 0 13 0 ...	1	8 1
Phosphoric acid, as fine bone ...	9.14 × 0 4 6 ...	2	1 2
Phosphoric acid, as coarse bone ...	12.36 × 0 3 6 ...	2	3 3
Value per ton		£6	16 4

Another example may be cited, that of a bone fertilizer.

The tag accompanying each bag of typical low-grade bone fertilizer should state the total nitrogen, and the citrate soluble and citrate insoluble phosphoric acid content, as under:

Nitrogen	3.00 per cent.
Phosphoric acid, citrate soluble	3.00 ,,
Phosphoric acid, citrate insoluble	12.00 ,,
Phosphoric acid, total	15.00 ,,

The unit values affixed for these ingredients in this manure are as follow:—

Nitrogen	£0 13 0
Phosphoric acid, citrate soluble	0 4 6
Phosphoric acid, citrate insoluble	0 3 0

To determine the value per ton of this manure, multiply the percentage of each ingredient by the unit value for same, as follows:—

Nitrogen	3.00 × £0 13 0 ...	£1	19 0
Phosphoric acid, citrate soluble ...	3.00 × 0 4 6 ...	0	13 6
Phosphoric acid, citrate insoluble ...	12.00 × 0 3 0 ...	1	16 0
Value per ton		£4	8 6

These two examples are intended to draw attention to the difference between a bonedust and a bone fertilizer. In the first place, it will be evident that the form of guarantee is different. That being so, there must be some reasons for this. The answer is best supplied by a clause in the principal Act which describes a bonedust as consisting only of bones and recently disintegrated animal matter. When a manure contains other ingredients, it can no longer be recognised as a bonedust. To meet this, the term bone fertilizer originated. A bone fertilizer is a manure containing besides bones and animal matter, some other ingredients added in the process of manufacture. Bone fertilizers classed as high grade are similar in all respects to an ordinary bonedust, but differ in containing foreign materials, principally gypsum, as an adulterant. This material has no manurial value according to the Act but is used to lessen the loss of nitrogen. The low-grade bone fertilizer is practically a mixed manure, starting with bonedust as a base. The phosphoric acid is added to by ground rock phosphate and superphosphate. The addition of the ground rock phosphate alters the solubility of the manure, rendering its phosphoric acid content, more difficultly soluble; these manures are therefore generally guaranteed as containing the greater portion of their phosphoric acid in an insoluble condition.

As stated before in connexion with difficultly soluble manures, the value of a manure for a quick return from an agricultural stand-point depends principally on its content of readily available ingredients. In using manures, therefore, a buyer will be best served by employing those manures which contain the greater percentage of readily available ingredients. Bonedust is preferable to bone fertilizer, because it is more soluble when applied to the average soil.

Artificial Manures Act.

UNIT VALUES FOR THE YEAR 1915 AS CALCULATED FROM THE DECLARED PRICES OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE.

	s.	d.
1 per cent. of Nitrogen as Nitrate	18	8
1 per cent. of Nitrogen as Ammonia	15	5
1 per cent. of Nitrogen as Blood	16	9
1 per cent. of Nitrogen as Fine Bone	15	0
1 per cent. of Nitrogen as Coarse Bone and Flesh	13	0
1 per cent. of Phosphoric Acid as Water Soluble	4	7
1 per cent. of Phosphoric Acid as Citrate Soluble	4	6
1 per cent. of Phosphoric Acid as Fine Bone	4	6
1 per cent. of Phosphoric Acid as Coarse Bone	3	6
1 per cent. of Phosphoric Acid as Insoluble in Thomas Phosphate and High-grade Bone and Animal Fertilizers	3	6
1 per cent. of Phosphoric Acid as Insoluble in Low-grade Bone Fertilizers and Bone and Super.	3	0
1 per cent. of Phosphoric Acid in Superphosphate and Nitro Supers.	2	9
1 per cent of Potash as Sulphate	5	8
1 per cent. of Potash as Chloride	4	10

Note.—Potash as Sulphate in Kainit.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS.

Description of Manure		Nitrogen	Phosphoric Acid.	Potash.	Price asked for the Manure per Ton.	Where Obtainable.
		%	%	%	£ s. d.	
Mainly Nitrogenous						
Nitrate of Soda	Federal S.N.	15·50	..	..	14 10 0	Australian Explosives and Chemical Co., Melbourne
..	Sackle	15·50	..	..	14 10 0	Cuming, Smith, and Co., Melbourne
..	Haselt's	15·50	..	..	14 7 6	A. H. Hasell, Melbourne
..	M.L.	15·50	..	..	14 10 0	Mt. Lyell M. and R. Co., Melbourne
..	Wischer and Co.	15·50	..	..	14 10 0	Wischer and Co., Melbourne
Nitrate of Potash	Sackle	13·00	..	44·00	28 0 0	Cuming, Smith, and Co., Melbourne
..	M.L.	13·00	..	44·00	28 0 0	Mt. Lyell M. and R. Co., Melbourne
Sulphate of Ammonia	Federal A.S.	20·00	..	..	16 0 0	Australian Explosives and Chemical Co., Melbourne
..	B.G. Co.	20·00	..	..	14 0 0	Ballarat Gas Co., Ballarat
..	Sackle	20·00	..	..	16 0 0	Cuming, Smith, and Co., Melbourne
..	Hasell's	20·00	..	..	15 17 6	A. H. Hasell, Melbourne
..	M.G. Co.	20·00	..	..	14 0 0	Metropolitan Gas Co., Melbourne
..	M.L.	20·00	..	..	16 0 0	Mt. Lyell M. and R. Co., Melbourne
..	Wischer and Co.	20·00	..	..	16 0 0	Wischer and Co., Melbourne
Blood	Injected	11·50	1·00	0·18	9 0 0	W. Angliss and Co., Melbourne
..	Federal Blood	7·50	1·00	..	6 10 0	Australian Explosives and Chemical Co., Melbourne
* ..	Champion	9·50	1·50	0·00	7 10 0	John Cooke and Co. Pty. Ltd., Melbourne
..	Sackle	7·50	1·00	..	6 10 0	Cuming, Smith, and Co., Melbourne
..	Hasell's	7·50	1·00	..	6 10 0	A. H. Hasell, Melbourne
..	M.G.C.	7·50	1·00	0·41	5 0 0	Melbourne City Council, Melbourne
Blood "A"	M.L.	11·00	..	..	10 0 0	Mt. Lyell M. and R. Co., Melbourne
Blood "B"	..	7·50	1·00	..	6 10 0	.. .. ..
Blood	Bobs	2·75	..	..	3 0 0	P. Bobs, Bendigo
..	Wischer and Co.	7·50	1·00	..	6 10 0	Wischer and Co., Melbourne
Mainly Potash						
Potash Chloride (Muriate)	Federal P.M.	..	..	60·00	14 10 0	Australian Explosives and Chemical Co., Melbourne
..	Sackle	..	..	60·00	14 10 0	Cuming, Smith, and Co., Melbourne
..	M.L.	..	..	60·00	14 10 0	Mt. Lyell M. and R. Co., Melbourne
..	Wischer and Co.	..	..	60·00	14 10 0	Wischer and Co., Melbourne
Kainit	Sackle	..	..	12·40	5 0 0	Cuming, Smith, and Co., Melbourne
..	M.L.	..	..	12·40	5 0 0	Mt. Lyell M. and R. Co., Melbourne
..	Wischer and Co.	..	..	12·40	5 0 0	Wischer and Co., Melbourne
Sulphate of Potash, 90%	Federal P.S.	..	..	48·00	13 10 0	Australian Explosives and Chemical Co., Melbourne
..	..	..	..	51·00	14 12 6	.. .. ..
.. 90%	Sackle	..	..	48·00	13 10 0	Cuming, Smith, and Co., Melbourne
.. 95%	..	..	..	51·00	14 12 6	.. .. ..
.. " B "	Hasell's	..	..	52·00	20 0 0	A. H. Hasell, Melbourne
.. " A "	M.L.	..	..	48·00	13 10 0	Mt. Lyell M. and R. Co., Melbourne
..	..	..	..	51·00	14 12 6	.. .. ..
.. 90%	Wischer and Co.	..	..	48·00	13 10 0	Wischer and Co., Melbourne
.. 95%	..	..	..	51·00	14 12 6	.. .. ..

* Not for retail

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.	Price asked for the Manure per ton.			Where Obtainable.
			Water Soluble.	Citrate Soluble.	Insoluble.	Total.		£	s.	d.	
Mainly Phosphoric Acid readily Soluble.		%	%	%	%	%	%				
Superphosphate ..	Federal O.S.		17·00	1·00	2·00	20·00	..	4	7	6	Australian Explosives and Chemical Co., Melbourne
.. ..	Florida Sickle		17·00	1·00	2·00	20·00	..	4	7	6	Cuming, Smith, and Co., Melbourne
.. ..	Hasell's		17·50	0·50	2·00	20·00	..	4	7	6	A. H. Hasell, Melbourne
Superphosphate, No. 1 ..	M.L.		17·00	1·00	2·00	20·00	..	4	7	6	Mt. Lyell M. and R. Co., Melbourne
Superphosphate ..	Rohs		16·85	1·70	0·45	19·00	..	4	10	0	P. Rohs, Bendigo
Superphosphate, No. 1 ..	Wischer and Co. ..		17·00	1·00	2·00	20·00	..	4	7	6	Wischer and Co., Melbourne
Concentrated Superphosphate	Federal Conc. S. ..		40·00	4·00	..	44·00	..	12	10	0	Australian Explosives and Chemical Co., Melbourne
.. .. ..	Sickle Conc. Super. ..		40·00	4·00	..	44·00	..	12	10	0	Cuming, Smith, and Co., Melbourne
.. .. ..	M.L. Conc. Super. ..		40·00	4·00	..	44·00	..	12	10	0	Mt. Lyell M. and R. Co., Melbourne
.. .. ..	Wischer and Co. Conc Super. ..		40·00	4·00	..	44·00	..	12	10	0	Wischer and Co., Melbourne
Mainly Phosphoric Acid moderately Soluble.											
Thomas Phosphate ..	Federal		..	14·00	3·00	17·00	..	4	7	6	Australian Explosives and Chemical Co., Melbourne
.. .. ..	Sickle		..	14·00	3·00	17·00	..	4	7	6	Cuming, Smith, and Co., Melbourne
.. .. ..	Hasell's		..	14·00	3·00	17·00	..	4	2	6	A. H. Hasell, Melbourne
.. .. ..	M.L.		..	14·00	3·00	17·00	..	4	7	6	Mt. Lyell M. and R. Co., Melbourne
.. .. ..	Wischer and Co. ..		..	14·00	3·00	17·00	..	4	7	6	Wischer and Co., Melbourne
Mainly Phosphoric Acid and Nitrogen difficultly Soluble—High Grade.											
*Bone Fertilizer ..	Redbank J. C. ..	6·00	..	6·70	7·30	14·00	..	6	0	0	J. Cooke and Co., Melbourne
.. .. ..	Magic	5·00	..	3·00	10·00	13·00	..	6	10	0	G. Gardiner and Co., Geelong
.. .. ..	Horseshoe	4·50	..	4·70	10·70	15·40	..	5	15	0	P. Fitzgerald and Sons, Bentleigh
.. .. ..	Ark	3·52	..	3·98	12·00	16·88	..	6	0	0	A. Murphy, Ararat
*Animal Fertilizer ..	Champion ..	6·50	..	4·50	5·00	9·50	..	6	0	0	J. Cooke and Co., Melbourne
Low Grade.											
Bone Fertilizer	Federal B.F. ..	4·00	..	3·00	13·00	16·00	..	6	2	6	Australian Explosives and Chemical Co., Melbourne
.. .. ..	Sickle	3·00	..	3·00	13·00	16·00	..	6	2	6	Cuming, Smith, and Co., Melbourne
Fertilizer, No. 1 ..	Magic	3·00	..	3·00	14·00	17·00	..	5	5	0	G. Gardiner and Co., Geelong
Fertilizer, No. 2 ..	.. ..	2·50	..	3·00	13·00	16·00	..	5	0	0	.. .. ..
Bone Fertilizer, "A" ..	Hasell's	4·25	..	5·00	14·00	19·00	..	7	0	0	A. H. Hasell, Melbourne

Bone Fertilizer, "B" ..	Hasell's ..	..	3·15	..	3·77	15·43	19·20	..	6 15 0	A. H. Hasell, Melbourne
Bone Fertilizer, "C" ..	.. ..	..	2·52	..	2·73	15·51	18·24	..	5 15 0	.. ..
Bone Fertilizer, "B" ..	M.L. ..	..	3·00	..	3·00	13·00	16·00	..	6 2 6	Mt. Lyell M. and R. Co., Melbourne
Animal Fertilizer ..	A.N.A. Surprise	..	1·00	..	4·00	12·00	16·00	..	6 0 0	G. W. Peuncll, Braybrook
Bone Fertilizer	Wischer and Co.	..	2·00	..	3·00	13·00	16·00	..	6 2 6	Wischer and Co., Melbourne
Blood and Bone Fertilizer	Federal B. and B.F.	..	3·00	..	3·00	12·00	15·00	..	7 0 0	Australian Explosives and Chemica Co., Melbourne
.. .. ..	Sickle ..	..	5·00	..	3·00	12·00	15·00	..	7 0 0	Cuming, Smith, and Co., Melbourne
Blood and Bone Fertilizer, "A"	M.L. ..	..	5·00	..	3·00	12·00	15·00	..	7 0 0	Mt. Lyell M. and R. Co., Melbourne
Blood and Bone Fertilizer	Wischer and Co.	..	5·00	..	3·00	12·00	15·00	..	7 0 0	Wischer and Co., Melbourne
Moderately Soluble.										
Dissolved Bone and Superphosphate	Sickle ..	..	1·00	10·00	3·88	5·48	19·37	..	5 10 0	Cuming, Smith, and Co., Melbourne
.. .. ..	M.L. ..	..	1·00	10·00	3·75	5·25	19·00	..	5 10 0	Mt. Lyell M. and R. Co., Melbourne
.. .. ..	Wischer and Co.	..	1·00	10·00	3·75	5·25	19·00	..	5 10 0	Wischer and Co., Melbourne
Nitro Superphosphate ..	Federal N.S.	..	1·10	13·00	1·00	5·00	19·00	..	5 10 0	Australian Explosives and Chemical Co., Melbourne
.. .. ..	Sickle ..		2·00	13·00	0·76	2·52	16·28	..	5 10 0	Cuming, Smith, and Co., Melbourne
.. .. ..	Hasell's ..	..	1·50	14·00	1·00	3·00	18·00	..	5 8 6	A. H. Hasell, Melbourne
.. .. ..	M.L. ..	..	2·00	13·00	0·76	2·52	16·28	..	5 10 0	Mt. Lyell M. and R. Co., Melbourne
.. .. ..	Wischer and Co.	..	2·00	13·00	0·76	2·52	16·28	..	5 10 0	Wischer and Co., Melbourne
Bone and Blood Fertilizer and Superpho-phate	Federal B.B.S.	.	2·50	8·50	2·00	7·00	17·50	..	6 5 0	Australian Explosives and Chemical Co., Melbourne
Bone and Blood Fertilizer and superpho-phate, "B"	Sickle ..	..	2·50	8·50	2·00	7·00	17·50	..	6 5 0	Cuming, Smith, and Co., Melbourne
Bone and Blood Fertilizer and Superphosphate	M.L. ..	..	2·50	8·50	2·00	7·00	17·50	..	6 5 0	Mt. Lyell M. and R. Co., Melbourne
.. .. ..	Wischer and Co.	..	2·50	8·50	2·00	7·00	17·50	..	6 5 0	Wischer and Co., Melbourne
High Grade.										
Bone and Superphosphate	Magic ..	..	1·25	8·00	3·20	5·80	17·00	..	5 5 0	G. Gardiner and Co., Geelong
.. .. ..	Rohs ..	.	1·50	9·00	2·25	5·75	17·00	..	5 10 0	P. Rohs, Bendigo
Low Grade										
Bone Fertilizer and Superphosphate	Federal B.S. No. 1		1·50	8·50	3·50	6·00	18·00	..	5 12 6	Australian Explosives and Chemical Co., Melbourne
.. .. ..	Federal B.S. No. 3		0·75	12·75	1·75	4·50	19·00	..	5 5 0	.. .. ..
Bone Fertilizer and Superphosphate, "A"	Sickle ..	..	1·50	8·50	3·50	6·00	18·00	..	5 12 6	Cuming, Smith, and Co., Melbourne
Bone Fertilizer and Superphosphate, "C" *	.. ..	..	0·75	12·75	1·75	4·50	19·00	..	5 5 0	.. .. ..
Bone and Superphosphate, one-quarter and three-quarters	Hasell's ..	..	0·80	12·75	1·00	5·50	19·25	..	5 4 0	A. H. Hasell, Melbourne
Bone and Superpho-phate, one-half and one-half	.. ..	..	1·50	8·50	0·50	9·50	18·50	..	5 11 6	.. ..
Bone Fertilizer and Superpho-phate, No. 1	M.L. ..	..	1·50	8·50	3·50	6·00	18·00	..	5 12 6	Mt. Lyell M. and R. Co., Melbourne

* Not for retail.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS —*continued*.

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.	Price asked for the Manure per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Insoluble.	Total.			
		%	%	%	%	%	%	£ s. d.	
Low Grade—continued.									
Bone Fertilizer and Superphosphate, No. 2	M.L.	0·75	12·75	1·75	4·50	19·00	..	5 5 0	Mt. Lyell M. and R. Co., Melbourne
Animal Fertilizer and Superphosphate	A.N.A. Surprise ..	1·50	7·50	2·00	7·00	16·50	..	5 15 0	G. W. Pennell, Braybrook
Bone Fertilizer and Superphosphate, No. 1	Wischer and Co. ..	1·50	8·50	3·50	6·00	18·00	..	5 12 6	Wischer and Co., Melbourne
Bone Fertilizer and Superphosphate, No. 2	" " ..	0·75	12·75	1·75	4·50	19·00	..	5 5 0	" " "
Containing Nitrogen, Phosphoric Acid, and Potash.									
Grass (Laying Down) ..	Federal G.L. ..	0·50	11·00	0·64	6·30	17·94	2·00	5 5 0	Australian Explosives and Chemical Co., Melbourne
Grass (Top Dressing) ..	Federal T.D. ..	1·60	11·00	0·64	1·30	12·94	1·50	5 5 0	" " " "
Horticultural	Federal H.M. ..	2·50	11·62	0·68	1·38	13·68	10·00	9 0 0	" " " "
Maize	Federal M.Z. ..	2·36	10·20	0·60	6·20	17·00	2·00	6 7 6	" " " "
Onion	Federal M.G. ..	2·00	11·00	0·64	1·30	12·94	5·00	6 7 6	" " " "
Orchard	Federal F.M. ..	1·80	13·22	0·78	1·55	15·55	8·00	7 7 6	" " " "
Pea, Bean, and Clover ..	Federal P.B. ..	0·50	10·00	0·60	4·20	14·80	3·00	5 5 0	" " " "
Potato	Federal Potato ..	1·00	14·00	0·80	1·64	16·44	5·00	8 7 6	" " " "
Beet	Federal Beet ..	1·50	11·00	0·75	1·25	13·00	5·50	8 12 6	" " " "
Vine	Federal V.S.P. ..	7·00	7·15	0·42	0·84	8·41	12·00	12 10 0	" " " "
A. and P. Mildura, No. 1	Sickle	3·46	9·41	0·55	1·10	11·06	11·60	9 7 6	Cuming, Smith, and Co., Melbourne
Citrus, Mildura, No. 1 ..	.. .. ..	1·39	3·79	0·22	7·87	11·88	16·25	8 15 0	" " " "
Grass	.. .. ..	0·39	11·05	0·65	8·85	20·55	3·00	5 5 0	" " " "
Horticultural	.. .. ..	4·00	11·22	0·66	1·32	13·20	8·40	9 0 0	" " " "
Maize	.. .. ..	2·20	14·62	0·86	1·72	17·20	1·80	6 7 6	" " " "
Onion	.. .. ..	2·00	13·60	0·80	1·60	16·00	3·60	6 7 6	" " " "
Orchard	.. .. ..	2·46	12·92	0·76	1·52	15·20	7·20	7 7 6	" " " "
Potato, "A"	.. .. ..	1·40	8·00	3·10	5·88	16·98	5·20	7 0 0	" " " "
Potato, "B"	.. .. ..	1·20	14·62	0·86	1·72	17·20	4·16	6 7 6	" " " "
Root Crop	.. .. ..	1·30	8·00	3·10	5·88	16·98	5·20	7 0 0	" " " "
Rose	.. .. ..	3·94	8·18	0·36	0·72	7·26	13·94	12 0 0	" " " "
Vine, Mildura, No. 1 ..	.. .. ..	5·53	7·14	0·42	0·84	8·40	11·60	10 15 0	" " " "

Vine, Mildura, No. 3	Sickle	7·14	7·14	0·42	0·84	8·40	11·60	11	2	6	Cuming, Smith, and Co., Melbourne
Vine	"	2·40	12·92	0·76	1·52	15·20	7·20	7	7	6	" " " "
Vine, "B"	"	1·25	10·62	0·63	5·00	16·25	7·50	6	15	0	" " " "
Fodder Crop	Hasell's	2·00	11·50	1·00	2·00	14·50	1·00	6	8	6	A. H. Hasell, Melbourne
Grass	"	2·50	11·25	1·00	8·50	20·75	2·50	5	10	0	" "
Horticultural	"	3·00	11·00	0·50	2·00	13·50	8·00	9	10	0	" "
Lawn Manure	"	0·50	11·25	1·00	8·50	20·75	2·50	5	10	0	" "
Maize	"	3·00	11·50	1·25	2·00	14·75	1·00	6	8	6	" "
Onion	"	3·00	11·50	1·00	1·50	12·00	3·06	6	12	6	" "
Orchard	"	2·00	14·00	0·75	0·25	15·00	7·14	8	0	0	" "
Potato	"	1·00	12·75	0·75	2·00	15·50	6·00	6	17	6	" "
Root Crop	"	3·20	8·00	1·00	2·50	11·50	4·50	7	5	0	" "
Sugar Beet	"	4·00	11·00	0·75	1·25	13·00	8·20	9	13	6	" "
Tomato	"	3·80	11·00	0·50	2·00	13·50	8·00	9	10	0	" "
Vine	"	2·00	14·00	0·75	0·25	15·00	7·14	8	0	0	" "
A. and P., No. 1, Mildura	M.L.	4·46	9·41	0·55	1·10	11·06	11·57	9	12	6	Mt. Lyell M. and R. Co., Melbourne
Barley	"	0·80	15·00	1·00	1·50	17·50	2·00	5	10	0	" " " "
Citrus, No. 1, Mildura	"	1·39	3·61	0·21	7·82	11·64	10·88	8	17	6	" " " "
Fodder Crop	"	3·00	11·84	0·70	2·46	15·00	1·00	6	7	6	" " " "
Grass (Laying Down)	"	0·30	11·05	0·65	9·05	20·75	2·70	5	5	0	" " " "
Grass (Top Dressing)	"	0·90	12·00	3·50	1·50	17·00	1·00	5	5	0	" " " "
Horticultural	"	4·00	11·00	0·75	1·45	13·20	8·25	9	0	0	" " " "
Lawn	"	0·90	12·00	3·50	1·50	17·00	1·00	5	5	0	" " " "
Maize	"	3·00	11·84	0·70	2·46	15·00	1·00	6	7	6	" " " "
Onion	"	3·00	10·35	0·61	2·04	15·00	3·00	6	7	6	" " " "
Orchard	"	2·35	13·00	0·75	1·50	15·25	7·20	7	7	6	" " " "
Potato	"	1·20	14·50	1·00	1·70	17·20	4·15	6	7	6	" " " "
Potato (with Bone)	"	1·05	8·50	0·50	7·30	16·30	8·80	7	0	0	" " " "
Rape	"	1·00	15·00	1·00	2·50	18·50	1·00	5	10	0	" " " "
Root Crop	"	3·18	9·59	0·56	2·13	12·28	4·75	6	17	6	" " " "
Rose	"	4·00	6·50	0·50	0·50	7·50	14·00	12	0	0	" " " "
Tomato	"	4·00	11·00	0·75	1·45	13·20	8·25	9	0	0	" " " "
Vine	"	2·35	13·00	0·75	1·50	15·25	7·20	7	7	6	" " " "
Vine, "B"	"	1·25	10·63	0·63	5·24	16·50	7·50	6	15	0	" " " "
Vine, No. 1, Mildura	"	5·53	6·98	0·41	0·82	8·21	12·07	10	15	0	" " " "
Vine, No. 3, Mildura	"	7·14	6·38	0·41	0·82	8·21	12·07	11	5	0	" " " "
Vine, No. 5, Mildura	"	1·00	5·67	0·84	6·00	12·01	17·33	8	15	6	" " " "
Vine, No. 6, Mildura	"	1·12	6·37	0·38	6·75	13·50	14·00	7	17	6	" " " "
Grass	Wischer and Co.	0·75	9·77	0·57	5·16	15·50	2·60	5	5	0	Wischer and Co., Melbourne
"Key" Fertilizer	"	0·50	15·30	0·90	1·80	18·00	2·60	5	15	0	" " " "
Hop Manure	"	2·00	13·60	0·80	1·60	16·00	5·20	7	2	6	" " " "
Horticultural	"	3·00	11·26	0·66	1·33	13·25	9·75	9	0	0	" " " "
Maize	"	1·75	14·66	0·86	1·75	17·27	2·60	6	7	6	" " " "
Market Gardener's	"	3·38	9·35	0·55	1·10	11·00	6·50	7	7	6	" " " "
Nurseryman's Plant Food	"	5·00	8·50	0·50	1·00	10·00	13·00	12	0	0	" " " "
Onion	"	2·50	9·35	0·55	1·10	11·00	4·55	6	7	6	" " " "
Orchard	"	3·38	9·35	0·55	1·10	11·00	6·50	7	7	6	" " " "
Potato (with Bone)	"	1·05	8·50	0·50	6·60	15·60	7·80	7	0	0	" " " "
Potato	"	0·94	12·97	0·76	1·52	15·25	5·85	6	7	6	" " " "
Rape	"	1·00	15·00	1·00	2·50	18·50	1·00	5	10	0	" " " "
Rose	"	4·00	6·80	0·40	0·80	8·00	15·60	12	0	0	" " " "
Vine	"	3·00	8·50	0·50	1·00	10·00	7·80	7	7	6	" " " "

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS *continued*.

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.	Price asked for the Manure per ton.			Where Obtainable.
			Water Soluble.	Citrate Soluble.	Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%				
Containing Phosphoric Acid and Potash only.											
Special Grain	Federal S.G. ..	..	16·50	1·00	2·00	19·50	0·75	5	0	0	Australian Explosives and Chemical Co., Melbourne
.. .. ..	Federal S.G., No. 1 ..	..	16·50	1·00	2·00	19·50	1·50	5	5	0	" " " "
Leguminous	Sickle	..	15·30	1·00	1·90	18·20	2·60	5	5	0	Cuming, Smith, and Co., Melbourne
.. .. ..	Hasell's	..	12·00	1·00	3·00	16·00	4·50	5	15	0	A. H. Hasell, Melbourne
.. .. ..	M.L.	..	15·30	1·00	1·90	18·20	2·60	5	5	0	Mt. Lyell M. and R. Co., Melbourne
.. .. ..	Wischer and Co. ..	..	15·30	0·90	1·80	18·00	2·60	5	5	0	Wischer and Co., Melbourne
Pea	.. .. ..	..	14·45	0·85	1·70	17·00	7·80	6	10	0	.. .. ..
Containing Nitrogen and Phosphoric Acid only.											
Rape	Federal Rape ..	2·00	13·00	0·76	2·52	16·28	..	5	10	0	Australian Explosives and Chemical Co., Melbourne
A. and P., Mildura, No. 2	Sickle	4·45	12·11	0·71	1·42	14·24	..	7	12	6	Cuming, Smith, and Co., Melbourne
Citrus, Mildura, No. 2 ..	.. .. ..	2·02	5·52	0·32	11·45	17·29	..	5	17	6	" " " "
Grass (Top Dressing) ..	.. .. ..	0·77	16·15	0·95	1·90	19·00	..	5	5	0	" " " "
Rape	.. .. ..	2·00	13·00	0·76	2·52	16·28	..	5	10	0	" " " "
Vine No. 2, Mildura ..	.. .. ..	7·13	9·18	0·54	1·08	10·80	..	9	7	6	" " " "
Vine, No. 4, Mildura ..	.. .. ..	9·20	9·18	0·54	1·08	10·80	..	10	0	0	" " " "
Rape	Hasell's	1·20	14·25	1·00	2·25	17·50	..	5	7	6	A. H. Hasell, Melbourne
A. and P., No. 2, Mildura	M.L.	5·75	12·11	0·71	1·42	14·24	..	8	0	0	Mt. Lyell M. and R. Co., Melbourne
Citrus, No. 2, Mildura ..	.. .. ..	2·02	5·54	0·33	11·43	17·30	..	5	17	6	" " " "
Vine, No. 2, Mildura ..	.. .. ..	7·13	9·18	0·54	1·08	10·80	..	9	7	6	" " " "
Vine, No. 4, Mildura ..	.. .. ..	9·20	9·18	0·54	1·08	10·80	..	10	0	0	" " " "
Containing Phosphoric Acid only, difficultly soluble.											
Ground Phosphate, 80%	Federal G.P. ..	..	..	..	..	36·65	36·65	..	5	0	0	Australian Explosives and Chemical Co., Melbourne
" "	Sickle	..	..	..	..	36·65	36·65	..	5	0	0	Cuming, Smith, and Co., Melbourne
Ground Rock Phosphate 60%	Hasell's	..	..	..	..	27·50	27·50	..	3	15	0	A. H. Hasell, Melbourne
Ground Phosphate, 50%	M.L.	..	..	..	..	23·00	23·00	..	3	10	0	Mt. Lyell M. and R. Co. Melbourne
Ground Phosphate, 80%	.. .. ..	..	..	..	..	36·65	36·65	..	5	0	0	" " " "
" " "	Wischer and Co. ..	..	..	..	..	36·50	36·50	..	5	0	0	Wischer and Co., Melbourne
Victoria Phosphate, No. 2	Victoria Phosphate, No. 2	..	..	2·00	13·00	15·00	..	2	10	0	T. O. Wolskel, South Melbourne
Victoria Phosphate, No. 1	Victoria Phosphate, No. 1	..	..	3·00	14·00	17·00	..	2	16	0	" " "

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.	MECHANICAL CONDITION.		Price asked for the Manure per ton.	Where Obtainable.
				Fine.	Coarse.		
Containing Nitrogen and Phosphoric Acid moderately soluble —High Grade.		%	%	%	%	£ s. d.	
Bonemeal	Sickle	3·00	19·00	30·00	70·00	7 0 0	Cuming, Smith, and Co., Melbourne
Bonedust	J.N.D.D.	4·25	20·87	33·00	67·00	6 0 0	J. N. Day, Pendigo
,, ...	Haselfs	4·40	19·00	55·00	45·00	7 5 0	A. H. Haself, Melbourne
,, ...	Varnsdall	3·86	23·25	33·70	66·30	6 15 0	Wm. Moore, Panmure
Bonemeal	M.L.	3·00	19·00	30·00	70·00	7 0 0	Mt. Lyell M. and R. Co., Melbourne
,, ...	Rohs	4·00	18·00	55·00	45·00	6 0 0	P. Rohs, Bendigo
,, ...	Marvel	3·74	23·62	36·00	64·00	6 10 0	Spriggs and Porter, Benalla
,, ...	Lion	3·85	21·50	31·00	69·00	6 10 0	A. Wray, Sale

REMINDERS FOR THOSE BUYING ARTIFICIAL FERTILIZERS.

By W. C. Robertson, Supervising Analyst.

Don't purchase artificial fertilizers of low grade, for you are only paying freight on the "filler."

Don't take delivery of any artificial manure without an invoice certificate. This is your safeguard.

Don't take delivery of unlabelled or unbranded bags of fertilizer.

Don't be satisfied unless you receive the manure you order. When ordering bonedust do not accept bone fertilizer.

Don't pay a higher price than the registered price per ton, plus freight. The Fertilizer Acts regulate the price at which any given manure can be sold.

Don't be dissatisfied should you weigh several bags of fertilizer and find them several pounds lighter than the guaranteed weight. Artificial fertilizers, especially superphosphate, contain water, and this, in transit, often dries out.

Don't worry over a "sticky" manure, or try to force it through the drill. It is better to immediately dry the manure by mixing with a proportion of dry sand or earth.

Don't think that the various brands of superphosphate vary in plant foods. Superphosphate is a simple manure supplying phosphoric acid only, and although different brands may vary in the amount of phosphoric acid they contain, you are wrong if you assume that different brands of "super.," under like conditions, will act differently on the same soil.

Don't forget to experiment, especially in the quantity of manure sown per acre. Departmental experiments during last year proved a dressing of 75 lbs. of "super." more profitable than 56 lbs.

Don't mix artificial manures haphazardly. In this connexion, unless experienced, always seek expert advice.

Don't buy a larger quantity of manure than you intend to use. There is sure to be trouble with the bags, and, furthermore, fertilizers, unlike wine, do not improve with age.

Don't allow bags of artificial fertilizers to get wet. Some fertilizers are extremely soluble, and the loss would be appreciable. Then, again, there is always the danger of trouble from lumps when drilling and the bursting of bags after drying.

Don't forget that artificial fertilizers do best on well tilled soil.

Don't think that the cereal crop is the only one on the farm which requires manuring. Even should your grass lands be eminently satisfactory, the trees in the orchard may respond to a dressing of fertilizer.

Don't waste the fowl and farmyard manure. Both are, "diluted," complete fertilizers, and, when well dried, are worth at least 5s. per ton in the open market, and worth considerably more on the farm. Remember their humus content.

Don't sell bones off your own farm at £3 per ton and buy them back in the form of bonedust at £6 10s. per ton. Distribute them over the "home" paddock; they will slowly decompose, thereby equalling a bonedust dressing.

Don't attempt to build up your soil with highly-priced "mixed" manures. The only successful method combines a good rotation, with green manuring, and the application of simple manures.

Don't discard sodium nitrate. A bag or two spread broadcast on the growing crop in the spring often proves a profitable transaction.

Don't forget that a careful system of tillage, together with a good rotation, will ultimately become important factors in the matter of manure bill and bank balance.

Don't leave small amounts of artificial manure in your drill between seasons. The drill should be carefully cleaned ere it is put away.

THE RESERVE SUPPLY OF PHOSPHATE ROCK IN THE UNITED STATES.

The Bureau of Soils, Washington, publishes the result of investigation into rock phosphate resources in U.S.A.

W. H. Waggaman was the investigator, and he estimates that 10,519,875,000 tons of rock phosphate of various grades is available. Giving the production in 1912 as approximately 3,000,000 tons, the author calculates that developed rock phosphate will last for over 1,100 years.

Whilst stating that the value of the material as a fertilizer still remains an open question, the author remarks that the sale and use of raw ground rock phosphate for direct application to the field is increasing.—*Journal Industrial and Engineering Chemistry*, June, 1914.

The raw rock phosphate used to furnish superphosphate to Australian agriculturists is mainly obtained from Ocean, Christmas, and Malden Islands. As the fields are privately owned or leased no figures are available as to the tonnage developed for the future use of the Australian farmer.

Very little, if any, of the raw ground rock is used as a fertilizer in Australia.

ACCORDING to Dr. Myers, the delegate for the Chilian Nitrate Committee in the United States of America:—"The beet sugar production of the United States for the year 1913 was the largest on record, amounting to 773,000 tons (of 2,000 lbs.) of sugar. The area under cultivation was 580,000 acres, the average yield being 2,500 lbs. of refined sugar per acre of beets, each ton of beets yielding about 250 lbs. of refined sugar. There were seventy-one factories in operation during 1913-14 season, and the industry is confined mostly to the Western States, except Michigan and Ohio."

THE MELBOURNE UNIVERSITY VETERINARY SCHOOL.

HISTORICAL.

The teaching of veterinary science in Australia had its inception in the establishment by Dr. W. T. Kendall, of the Melbourne Veterinary College, at Fitzroy, Melbourne, in the year 1888. The following year the Veterinary Surgeons Act was placed on the statute-book of the State of Victoria, and the new school was later recognised as a teaching institution by the Board established under the provisions of that Act. Although entirely a private institution in that it received no support from any public body, or funds, it is worthy of permanent record that it was the first Veterinary College in the world to establish a four years' course in veterinary science as a necessary qualification for a diploma.

For many years it was obvious to those who were interested in veterinary training and veterinary science that such an institution was deserving of very considerable public support, and that it should be placed on a permanent and satisfactory basis.

The Veterinary Research Institute.

In 1906 a joint committee of representatives of the Government and of the University was established for the purpose of inquiring into the whole position, and, as a result of its investigations, the Government agreed to provide the funds necessary for the erection and equipment of a thoroughly up-to-date Veterinary School, with adequate endowment, and the University decided to establish degrees and diplomas in veterinary science, while Dr. Kendall generously accepted the proposal to transfer his own services and the students attending his College to the University. That the City of Melbourne was equally enthusiastic in its approval of the proposal was shown by the graceful and generous offer of a valuable and very convenient portion of land adjacent to the University as a site for the new institution.

These various proposals received the sanction of Parliament early in 1909 by the enactment of the *University Act* 1909, and veterinary teaching in Australia entered on a new *régime* at the commencement of the University session of that year.

The Grounds.

Comprising 4 acres of valuable land, given by the Melbourne City Council to the University for this special purpose, the grounds are

The Dissecting Room.

"Searching a Foot."

bounded on three sides by broad public streets. The main frontage is on Flemington-road, from which the land rises to a much higher level facing Storey-street. The main entrance gates are at the corner of

Flemington-road and Park-street, within three minutes' walk of Sydney-road tramway line, while a side entrance into Storey-street affords a shorter route to the main University buildings adjacent. Planted and laid out according to a design kindly prepared by Mr. W. R. Guilfoyle, late Director of the Botanical Gardens, Melbourne, they, together with the various buildings, present a fine appearance when viewed from the gateway.

The buildings comprise the research and anatomy block, the hospital quadrangle, and the Cuming operating theatre, with surgical ward.

THE TEACHING OF STUDENTS.

To become a veterinary surgeon it is necessary for a student to have a good preliminary education, and he must pass one of the Public Examinations in the required subjects before being allowed to matriculate

Dispensing in the Pharmacy.

at the University. The veterinary course is one of four years' duration, and during the first year the student receives his education in the preliminary sciences of chemistry, botany, zoology, and physics. These are essential for a proper understanding of the more professional subjects, and in order that a veterinary graduate may rightly claim to be a scientifically educated man.

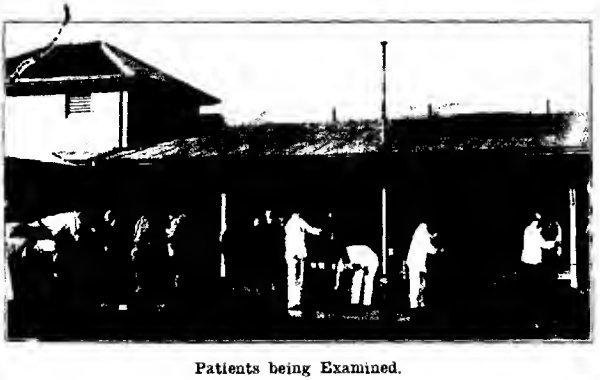
At the same time a beginning is made in the professional work by requiring the first year student to attend practical classes on stable management and demonstrations on the bones and joints of the domesticated animals.

Having successfully passed the subjects of the first year, the student proceeds in his second session to learn anatomy and physiology. To get a good knowledge of the structure and usefulness of a machine one

must see it at work and study the action and effect of each part, then take it to pieces, and build it up again. The living animal body is something more than a machine, but physiology and anatomy attempt to elucidate the structure, general and minute, and the function of each part of the body.

The Students' Laboratory.

Anatomy is best learned by means of careful dissection of all parts of the body, revealing and tracing out arteries, veins, and nerves; noting the relative positions of various organs, and making such a detailed survey of the body that the surgeon when operating shall have an intimate knowledge of his whereabouts, and so be able to achieve his object without serious damage to vulnerable structures in the vicinity.



Patients being Examined.

Physiology is a fascinating science, and is an answer, so far as human knowledge can supply one concerning the animal body, to the question, "How does it work?" This subject is taught in the physiology department of the medical school of the University.

But whilst physiology and anatomy occupy most attention in the second year, the student is also required to give some time to a continuation of the practical course in stable management, to lectures on horse-shoeing, and to instruction in the preparation and dispensing of the various drugs used in veterinary medicine. At the end of the second year the student takes his second examination.

In the third year the study of disease, its nature, causes, and treatment, really begins; having learnt something of the normal, the study of the abnormal can be commenced. The chief subject of the year is pathology and bacteriology. In the *post-mortem* room the gross changes produced by different diseases can be seen, and then the diseased parts can be subjected to microscopic examination for an elucidation of the detailed changes which have occurred. Further, it is of supreme importance to determine the cause of the disease, and in this connexion bacteriology and parasitology are studied. Many of the most serious animal diseases, such as anthrax and tuberculosis, are due

Canine Patients.

to bacteria—minute vegetable organisms allied to the fungi—and most of the advances of modern medicine and surgery have resulted from a study of the habits and characters of these microbes, a study established as a science by the untiring efforts and brilliant achievements of Pasteur, Lister, and Koch.

Even more recently investigations of disease have shown the extremely serious effects of animal parasites as causal agents and transmitters of disease. Mention need only be made of malaria in man transmited by mosquitoes, and red water or tick fever of cattle transmitted by ticks.

For a proper study of these subjects well-fitted laboratories are essential, and generous provision has been made for this in the school. The student has opportunities, not exceeded in any veterinary school, for obtaining a practical acquaintance with the appearances, habits, and methods of detection of these organisms, animal and vegetable, which cause disease, and of the means whereby they may be controlled or eradicated.

In this (third) year, too, hospital practice is commenced. The school has a large clinic, or out-patients hospital practice, to which persons unable to pay for professional attendance may bring their sick animals. About 1,500 cases are seen during the course of the school year, and the medicines supplied are dispensed mainly by students in the third year.

The "Cuming" Operating Theatre.

Another subject of considerable importance is that of hygiene and dietetics. Proper feeding of animals is of great importance in the prevention of disease, and the economic feeding of horses for work, and of cattle and sheep for the production of meat and milk, is essential for financial success. The laws of health in relation to the construction of

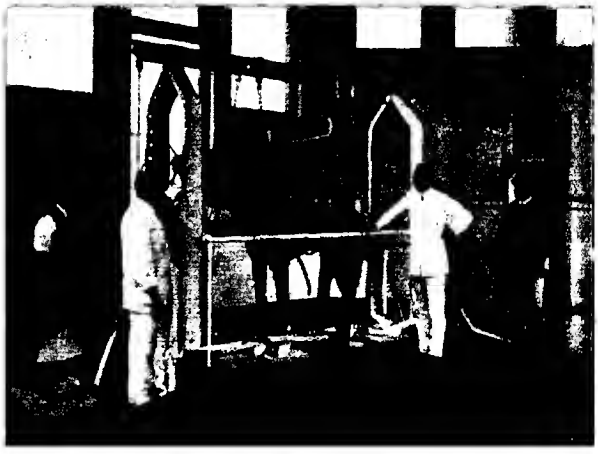
Probing a Wound.

stables, cow-sheds, their drainage, the water supply, and other similar matters are taught in this course. Animal conformation and the types for special purposes are studied both in the field and by means of lantern slides, whilst practical horse-shoeing finds a place in the work of the year. At the end of the year comes the third examination.

In the fourth year all the emphasis is on practical work. Medicine, surgery, and obstetrics are the main subjects, and hospital practice, and laboratory methods of diagnosis occupy a large part of the time. In connexion with the clinic is a hospital for in-patients capable of accommodating about twenty horses or cattle and fifty dogs. Suitable cases are selected from among the out-patients, and are kept in hospital for treatment or observation at a charge which covers cost of keep only.

For surgical operations, the facilities are extremely good. There is a spacious theatre, with a large horse operating table, a small operating room for dogs, and a good supply of instruments. All the important operations are performed under anæsthesia, chloroform, morphine, and cocaine being the chief anæsthetics employed.

With regard to medicine, the observation of symptoms and physical signs of disease is only possible when in-patients can be obtained, and



A Horse in the Operating Table.

the amount of experience gained in the school hospital is of the highest value for the subsequent practice of veterinary medicine.

Obstetrics is a branch of veterinary science which can only be learned satisfactorily as a result of experience in the country, in the foaling or calving season. At the same time, by means of specimens and diagrams, the general methods to be adopted and the use of instruments is taught, so that experience may be gained on right lines.

At the end of the fourth year the student proceeds to his final or qualifying examination, and, if successful, receives either the degree, Bachelor of Veterinary Science, or the licence, L.V.Sc., depending on whether he has matriculated or not. Both qualifications are accepted by the Veterinary Board of Victoria as qualifying for registration.

If the student is desirous of obtaining further distinctions, he may proceed to the degrees of Master and of Doctor of Veterinary Science in due course.

INVESTIGATION OF DISEASE.

In addition to the purely teaching work, the school is equipped as a Research Institution for the investigation of animal diseases. In a quadrangle adjoining the pathological laboratory are boxes for experimental animals, and these can be kept under close observation. In the case of an outbreak of some unknown or little understood disease, affected animals can be brought here, and the actual causation of the disease, together with methods of diagnosis, treatment, or prevention worked out, if possible. A convenient *post-mortem* room, and an incinerator for the destruction of any infectious material or dead bodies complete the quadrangle.

Operation on a Dog, under Chloroform.

THE OUTLOOK.

It is well to know that the Commonwealth and State Governments are employing more veterinary surgeons every year, and, as in other parts of the world, the services of scientifically trained veterinarians are being valued more and more highly, not so much in the treatment as in the prevention of contagious animal diseases.

In Victoria, in addition to the duty of administering the Stock Diseases Act, dealing with the notifiable contagious diseases of animals, the veterinary department is intrusted with the highly important work of the supervision of dairy cows and of the examination of stallions for the Government certificate.

Veterinary surgeons, too, are everywhere recognised as the fit and proper persons to have charge of meat inspection, and this duty is a highly important one in a meat exporting country like Australia.

The Army Veterinary Service bids fair to be an attractive one to the right kind of man, and how important it is to the State may be realized when no less than ten graduates from this school have received commissions as veterinary officers in the Australian Expeditionary Forces.

The Research Laboratory.

Private practice is not to be despised, and there are numbers of districts in Victoria where a veterinary surgeon is badly wanted. To a man about to farm land of his own, especially if interested in stock raising or horse breeding, the possession of a veterinary degree is a great

A Group of Veterinary Students, 1914.

asset, and four years spent in obtaining a degree at the University Veterinary School will not only supply this extremely useful knowledge, but will broaden his outlook and entitle him to be considered a scientifically educated man.

MILKING MACHINES IN VICTORIA.*

By R. T. Archer, Senior Dairy Inspector.

There are about fourteen different makes of milking machines in this State, and, as far as can be ascertained, 2,000 farmers have been supplied with machines or pulsators. Some of these have been put out of use for various reasons considered below. One of the principal advantages in connexion with machines is that it renders a farmer practically independent of labour, which is a difficult problem in this country.

When the machines are properly handled by those who take an interest in them, the results are thoroughly satisfactory. Especially is this the case with heifers first broken in to the machine. It is found also that the milk keeps satisfactorily. That this should be the case with proper handling is proved by the experience at the Talbot Institute for the supply of pure milk for infant feeding. On the other hand it is difficult, almost impossible, to persuade the average dairy-farmer to exercise the necessary care in cleansing the machines, and when this is neglected the quality of the produce suffers.

Types of Machine.

All the machines but one in use in this State are worked on the vacuum principle. The vacuum is produced either by pump or a steam ejector. The pump is the more economical except where there is an abundance of cheap fuel.

The systems in use are the bucket and the releaser, conduit, pipe or tank system, as it is variously called. The bucket system consists of covered buckets, into which the milk is conveyed through tubes direct from the cows' teats. In the pipe system the milk is conveyed from the teats through pipes to a tank in any convenient place. The latter is a very convenient system, but the pipes become an additional menace in careless hands. They are of brass or gun metal, with polished surface inside. Experiments have been made with strong, clear glass tubes to replace the metal, and it is easy to see if these are clean. It is the intention of one firm to exhibit these in use at the forthcoming Royal Agricultural Show. Various valve devices are used to provide automatic release of the milk, so that the vacuum may be sustained. In this State comparatively few of the machines are worked on the latter system, but in New Zealand a great number are in use, and are a great source of trouble to the managers of cheese and butter factories there.

Another type of apparatus used for milking, which, on account of its apparent cheapness and simplicity, is likely to find favour with the uninitiated, consists of four ordinary milk tubes or teat syphons with

* Paper read before the British Association for the Advancement of Science, Melbourne, 1914.

rubber tubes attached to convey the milk to the buckets. Of course users of these appliances run a very big risk of introducing septic bacteria.

Effect of the Machines on the Cows.

Many reliable authorities claim that cows milked with machines rarely have sore teats, and those that have rapidly heal, and do not bleed, as they do when milked by hand. Some claim that contagious mammitis is more likely to spread with machines, but this only applies to the careless man, and requires the necessary sanitary precautions; the use of disinfectants will prevent the spread of disease. There is no proof that the yield of milk is detrimentally affected. Several large dairymen have now been using the machines for ten or twelve years, and are satisfied with their experience. Some consider it a fault that the machines do not milk the cows dry, and try to do so by manipulation in various ways. I think it is more beneficial than otherwise that it is necessary to strip by hand, as the udder is subjected to a massaging which increases the circulation and prevents atrophy.

Cost of Upkeep.

This varies with the construction of the machine and the care bestowed upon it; but under proper treatment it may be put down about £1 per single machine per annum. Aluminium is largely used in the teat cups, and many of these appear to corrode rapidly at the top and bottom. Some attribute this to the milk not being properly cleaned off, but it is more probably due to the soda used in cleansing. It is questionable if aluminium is the most suitable for this purpose. Light gun metal or brass cups nickel plated appear to stand better. During the past season an all-metal teat cup was used in a large dairy with very satisfactory results, both from a mechanical and a sanitary point of view. As this largely reduces the amount of rubber required, it should be much cheaper to maintain.

The Sanitary Aspect.

The greatest problem in connexion with the milking machine as it presents itself in this country is with regard to sanitation. The difficulty is to impress users with the necessity for properly cleansing the machines as soon as possible and before the milk has time to dry. The experience gained through the Lady Talbot Institute goes to prove that with proper care milk can be produced giving an exceptionally low bacterial count.

Table showing Number of Micro-organisms per Cubic Centimetre.

	1911.	1912.	1913.	1914.
February	9,000	5,300	39,700	18,700
March	29,500	21,200	58,400	5,600
April	25,400	31,300	60,000	6,600
Average	21,333	19,266	52,700	10,300

Table showing average of micro-organisms per cubic centimetre after deleting the figures for the sample yielding the highest count each month. (This table gives a better idea of the bacterial condition of the bulk milk supplied by the institute.)

	1911.	1912	1913.	1914.
February	4,400	2,500	13,000	10,400
March	14,500	4,100	34,500	5,000
April	20,600	8,000	35,000	6,100
Average	13,166	4,866	27,500	7,166

For December, 1913, to April, 1914, the average count was 9,780. After deleting the highest count each month the average was 5,380. It must be borne in mind that these counts are the results of bacterial examination, obtained from milk delivered in the ordinary way many hours after milking.

Milking at the Talbot Farm.

In the summer of 1911 Mr. Norman McDonald, B.V.Sc., conducted an investigation into machine and hand-drawn milk to determine the relative bacterial content. This investigation was conducted at the farm from which the milk was obtained by the Lady Talbot Institute. This is a charitable organization instituted for the special purpose of providing infants with a pure milk supply from healthy, tuberculin-tested cows. At this farm the milking machines were in use, and the institute desired to have a comparative test made of both methods, the test to continue for the summer months. The farm was under the constant supervision and immediate control of a Government dairy supervisor, the circumstances were such as to render possible a complete comparative test of the two methods, working side by side, and under the very best conditions practicable.

The number of cows milked daily throughout the season averaged ninety-five, chiefly of the Ayrshire type, all having undergone veterinary inspection and the tuberculin test. They were kept in good condition, well fed and groomed twice daily, stalled at night, and during the day turned out into an area of about 20 acres, for exercise.

Food Supply.

The cows were fed mainly on fodder crops grown on the farm, with the addition of bran and a limited quantity of brewer's grains. Any food likely to be detrimental to the milk supply was guarded against, and no feeding allowed in the milking shed, but given to the cows immediately after milking.

Milking Methods.

The milking had been done throughout the season with three L.K.G. milking machines. Before the machines were applied, the milk of each cow was carefully examined by the supervisor, a small quantity being

drawn from each teat for the purpose, as a check against milk being used from injured udders, and also as a means of detecting the symptoms of any of the various diseases of the udder affecting the milk supply. These precautions were taken daily throughout the season. The fore-milk, about four streams from each teat, was then taken, and the teats and udders were carefully washed with warm water, clean water being used for each pair of cows. The machines were then applied, and after removal the cows were stripped out by hand into special buckets with cotton wool strainers fitted into the mouth. The milk, after being weighed, was passed through a cleansing centrifuge, and thence over the refrigerator, and the temperature reduced to 40 degrees Fahr., and immediately bottled, sealed, and dated, placed in crates, packed in ice, and delivered to the distributing agents within four hours after being milked, every caution being taken during the whole process to insure cleanliness. All utensils, milk bottles, and everything coming in contact with the milk, were sterilized twice daily. All teatcups and rubberware in connexion with the milking machines were boiled twice daily in soda water ½ per cent. strength, left in the sterile water between milkings, and immediately before being used were blown out with dry steam. The machines were also sterilized at intervals during the milking operations by being placed in boiling water and soda after each machine had milked a pair of cows, opportunity being taken for this work in the interval during which the bails were hosed down and a fresh section of the herd brought in. The process of sterilizing the milking machines received special attention by the supervisor through the season. All the employés at the dairy were provided with a clean suit of overalls and cap for each milking, and received instructions from the supervisor throughout the season on sanitary methods in the production and handling of milk for infants, the same staff being employed right throughout the season.

Sources of Contamination.

In hand-drawn milk the chief sources of contamination are—

1. The milker's hands, and, to some extent, his garments. In many cases there is no doubt that such are very important factors, especially where the method known as wet milking is pursued.

2. The skin of the cow, particularly that covering the udder and teats. This is a common source of infection, for often no precautions are taken in regard to thorough washing of the udder and grooming of the flank, consequently scurf, &c., frequently enter the pail.

3. Atmospheric dust and manure particles falling into the bucket during and subsequent to the process of milking.

4. The milk in the teat duct. It is well known that the first milk invariably shows a much larger bacterial content than the average milk, due to invasion by bacteria through the orifice of the teat duct between milkings.

In the machine the chief sources of contamination are likely to be—

1. The surface of the teat which is being intermittently washed by the milk as withdrawn.
2. Air drawn into the cup at each pulsation through the small "air admission" aperture.
3. Bacteria within the teat duct.
4. Dirt within the apparatus itself.

In conducting these investigations an endeavour was made to eliminate as far as practicable each and all of these sources of contamination in both the hand and machine milking.

For the purpose of the comparative test, four cows were selected, all being approximately of the same age, breed, and condition, and each giving about the same quantity of milk. Two were carefully milked by hand and two by machine. Fair samples from the total supply of each pair were placed, by the supervisor, in sterile bottles, securely stoppered and immediately cooled to about 40 degrees. Fahr. These bottles, each containing a pint, were retained at a low temperature until delivery at the laboratory, where they were placed in an ice chest until tested.

The tests were conducted during January, February, March, and April. During April, owing probably to the cooler weather, a marked general decrease in the bacterial content of both milks was experienced, the total number in each often falling below 250 per cubic centimetre. For this reason the counts obtained in April have not been included in working out the averages given below.

Throughout the test the appearance and palatableness of both milks were excellent, no taint or odour ever being detected, and the bottles on standing showed a good layer of cream. In regard to ordinary keeping qualities, the milk, when kept in the ice chest at about 50 degrees Fahr., invariably remained perfectly sweet and wholesome for at least forty-eight hours after milking, even during the hottest summer months.

General Bacteriological Results.

Throughout the period under review the average number of bacteria present per cubic centimetre was, in the hand milk, 7,500, and in the machine milk 6,750. Naturally there was often a decided difference between the bacterial content of the two samples. For example, it was found that on twenty-five occasions the hand milk contained at least twice the number of bacteria present in the machine milk, while on twelve days the machine showed at least double the number found in the hand milk.

For the first six weeks the strippings of the two machine-milked cows were added to the bulk before the sample for examination was secured. Subsequently, however, this practice was discontinued, it being considered that such a method was really not fair either to the hand or the machine, as, of course, the strippings were removed by hand.

That the removal of the strippings by hand and their subsequent addition to the machine milk seemed to deteriorate the latter from the stand-point of bacterial purity is indicated by the following figures. During the period when this practice was adopted, the hand milk showed

5,000 bacteria per cubic centimetre, and the machine milk showed 10,750 bacteria as daily average; but during the following period when no strippings were added to the machine-drawn milk, the average figures were 9,500 for the hand, and but 3,500 for the machine.

It must not be understood, however, that any definite and absolute conclusion can be drawn from these figures, for, as a matter of fact, it is seen that, during the first half of the first period, the average tests were much more approximate than during the second half.

Bacteria Isolated.

For the first few weeks the nature of the different bacteria found in the plates was carefully ascertained by subcultures on different media. It was found that both the species and the relative number of each species varied so greatly that any results of scientific value could not be expected from pursuing this work further. In regard thereto, it is sufficient to state that, in addition to the ordinary bacteria inducing lactic acid fermentation, cocci (particularly staphylococci) and sarcinæ were common, while streptococcus was comparatively rare. Various forms of saccharomyces were frequently encountered. The colon bacillus was not common, and the liquefying bacilli present were those commonly found in water.

A number of doubtful organisms were tested as to their pathogenicity on laboratory animals, but in no instance were the results fatal, and rarely was a passing inflammation produced.

Results of Investigation.

The results of the above investigations have demonstrated the following points:—

1. That, provided the apparatus of the milking machine is intelligently handled, and that it is thoroughly attended to as regards cleanliness and sterilization, its use does not interfere with the general health of the cow or of the udder.
2. That the milking machine so used does not lead to a greater bacterial contamination of the milk than does the process of hand milking, even when conducted under the most approved conditions; but that, on the contrary, the average results show an improvement.

Mr. McDonald says—"In common with others I have, however, noted in general practice that such pathological conditions as streptococcic mammitis, a common contagious disease of dairy cows, is much more readily spread by the milking machine than by hand. As such a catastrophe can be readily obviated by a routine examination of each cow's udder prior to milking, a practice generally adopted by progressive dairymen, its occurrence should not be attributed to the machine alone, but to the carelessness or ignorance of its owner.

"Given, therefore, the adoption of such precautions as are well within the compass of all dairymen, there appears to be no reason for anticipating any danger to the milking industry through the extension of the employment of such apparatus as approved milking machines when employed with due regard to their cleanliness and sterilization."

DETAILS OF EXAMINATION.

The following tables show the results of each day's examination of the hand and machine-drawn milks:—

Date.	Hours before Plating.	Hand.		Machine.	
		Temp. of Milk. Degrees Fahr.	No. of Bacteria per cubic centimetre.	Temp. of Milk. Degrees Fahr.	No. of Bacteria per cubic centimetre.
1911.					
Jan. 3 ..	13	59	4,000	59	3,780
4 ..	10	66	6,000	67	5,750
5 ..	9	75	3,000	76	10,000
6 ..	27	66	5,250	66	3,250
7 ..	9	71	4,500	71	5,000
9 ..	27	71	4,500	75	10,500
10 ..	9	73	10,750	73	3,750
11 ..	9	64	2,000	64	3,750
12 ..	8	64	3,000	65	2,750
19 ..	8	59	4,250	59	4,000
21 ..	28	57	3,500	57	2,250
23 ..	8	69	3,250	73	2,750
26 ..	10	74	1,500	74	1,250
27 ..	8	70	2,250	69	4,000
28 ..	27	60	3,500	60	2,000
30 ..	18	60	2,000	60	1,750
31 ..	18	60	1,500	60	7,250
Feb. 1 ..	18	55	2,750	55	13,780
2 ..	18	55	1,250	55	9,250
5 ..	18	53	1,750	55	6,750
6 ..	18	51	5,250	51	137,000
7 ..	18	53	9,000	54	1,500
8 ..	18	51	12,000	50	33,750
9 ..	18	50	3,500	59	8,500
10 ..	18	49	11,250	47	1,000
12 ..	18	51	24,000	51	11,500
13 ..	18	47	3,800	46	7,250
14 ..	18	51	9,000	51	1,500
15 ..	18	51	6,750	55	10,750
17 ..	18	51	1,250	55	2,500
20 ..	18	60	58,500	59	3,500
21 ..	18	55	3,500	55	1,000
22 ..	18	55	6,500	71	4,000
23 ..	18	55	15,250	59	5,000
24 ..	18	49	7,000	51	3,500
26 ..	18	49	2,500	51	3,250
27 ..	18	55	7,000	55	1,000
28 ..	18	54	9,000	53	15,500
March 1 ..	18	56	15,500	56	4,000
2 ..	18	56	7,000	56	500
3 ..	18	58	10,000	53	2,500
5 ..	18	59	2,500	62	750
6 ..	18	57	5,750	59	500
7 ..	18	55	22,500	59	1,500
8 ..	18	53	23,250	55	3,000
9 ..	18	51	8,250	55	500
10 ..	18	54	11,250	52	1,000
12 ..	18	59	4,750	59	1,500
13 ..	18	59	7,000	58	6,500
14 ..	18	55	4,000	53	2,000
15 ..	18	50	4,500	51	1,250
16 ..	18	55	5,000	51	2,750

DETAILS OF EXAMINATION—*continued.*

Date.	Hours before Plating.	HAND.		MACHINE.	
		Temp. of Milk. Degrees. Fahr.	No. of Bacteria per cubic centimetre.	Temp. of Milk. Degrees Fahr.	No. of Bacteria per cubic centimetre.
1911.					
March 17 ..	18	54	5,000	51	3,950
19 ..	18	55	5,500	55	1,000
20 ..	18	59	79,750	55	80,000
21 ..	18	53	2,500	50	4,750
23 ..	18	53	14,750	52	6,250
24 ..	18	57	15,000	57	3,250
26 ..	18	48	8,250	46	15,500
28 ..	18	46	11,250	50	8,750
31 ..	18	49	1,250	45	500
April 2 ..	18	15	5,000	50	750
3 ..	18	67	1,000	65	250
4 ..	18	56	250	57	1,250
5 ..	18	22	500	55	5,000
6 ..	18	52	*	53	*
7 ..	18	53	500	56	26,000
9 ..	18	51	*	49	1,250
10 ..	18	50	*	51	6,000
11 ..	18	49	250	49	*
12 ..	18	47	250	47	2,250
17 ..	18	56	*	57	*
18 ..	18	52	*	52	*
19 ..	18	50	*	50	*
20 ..	18	44	5,600	44	*
21 ..	18	46	5,750	47	250
24 ..	18	50	1,800	49	1,250
25 ..	18	48	1,400	49	2,400
26 ..	18	52	2,250	52	1,000
27 ..	18	52	4,500	52	500
28 ..	18	52	6,000	52	3,250

* Means less than 250 bacteria per cubic centimetre.

NOTES ON TABLES.

1. From 3rd January to 28th January the samples were taken from the morning milk.

2. From 30th January to 28th April the samples were taken from the evening milk.

3. From 3rd January to 14th February the machine milk was taken with the addition of the strippings drawn by hand.

4. From 15th February to 28th April the machine milk was taken without the addition of strippings.

5. From 15th February to 20th March the machines were used on test cows, immediately after removal of sterile solutions.

6. From 5th March to 28th April the milk was delivered in ice chest as despatched from farm and without re-packing.

7. From 21st March to 28th April the machines were used on test cows, after having previously milked ten cows.

8. From 9th April to 28th April, the cows were transposed as to method of milking.

On 28th March it was ascertained that the excessive high count was due to a particular batch of bottles not being properly sterilized.

RUTHERGLEN EXPERIMENT FARM.

SURVEY OF THE COMMONER WEEDS.

(Continued from page 346, Vol. XII.)

By G. H. Adcock, F.L.S., Principal, Viticultural College.

PART 2.

II.—LOCAL WEEDS PROCLAIMED FOR SOME PORTION OF THE STATE.

**Acacia armata.* R. Brown. Kangaroo Acacia. Order, Leguminosæ: The pod-bearing family. The generic name is from the Greek, and indicates that the plants on which the name was bestowed were spiny. The armed reference in the second name refers to the prickles. This is a native plant extensively used a generation ago for hedges, but going out of favour. It requires a vast amount of attention, and in case of fires the green foliage will burn fiercely.

**Cryptostemma calendulacea.* R. Brown. Cape Weed. Order, Compositæ: The Daisy family. The derivation is from Greek *kryptos,* concealed; *stemma,* a crown. The scaly crown of seeds is concealed in wool. The specific name compares this plant with the marigold.

This South African native has come to us *viâ* our western neighbours. It is a variable plant, prostrate in habit with succulent branches. The leaves are downy beneath. The flowers are large and golden, with dark centre. Where plentiful it gives quite a yellow appearance to the field during flowering. As it seeds freely it spreads rapidly and grows luxuriantly in spring, but dies out and leaves the ground bare on the first approach of heat. A few graziers speak well of its food value. But it unquestionably usurps the space of a better and more lasting growth. It also communicates an unpleasant taint to milk. Like other exuberant, succulent green feed, it is likely to cause trouble when hungry stock are allowed to gorge.

**Cucumis myriocarpus.* Naudin. Gooseberry cucumber. Occasionally called paddymelon, a name more properly applied to a kind of wallaby. Order, Cucurbitaceæ. *Cucumis* is Latin for cucumber, probably from *Curvus* from the shape of fruits. The specific name refers to the number of fruits borne on each plant. This is a trailing plant easily recognised by the gooseberry-shaped, bristly, and often striped fruits. As it seeds freely it is troublesome, but being an annual is easily coped with if seeding is prevented. A native of Cape Colony, this plant early earned in Australia a bad name for being the alleged cause of blindness, and even the death, of horses that acquire the habit of eating it. In the January, 1914, issue of the New South Wales *Agricultural Gazette,* is an account of some experiments with this plant, conducted by Dr. Cleland, Microbiologist. A calf was drenched with various quantities of these fruits up till finally 100 per day for three consecutive days were given without any ill effects. The plant emits a musky odour when tramped on or bruised.

**Erysimum repandum.* L. Treacle mustard. Order, Cruciferæ: The Cabbage family. The name of the genus is from the Greek *eryo,* to draw,

and refers to its former use in poultices; *repandum*, bent back or turned up (Latin), refers to the curve of seed vessels. This is a robust plant from the Mediterranean region. It has branched stems, yellow flowers, and long, bent, beaked fruits. With us it has a predilection for waste places, along hedges and fences. The popular name was given because one plant of this genus was formerly used as an ingredient of Venice treacle.

**Marrubium vulgare*. L. Horehound. Order, Labiatæ: The Sage family. The generic name is from a Hebrew word referring to the bitter

White Amaranth (*Amaranthus albus*, L.).

character of the plant. The specific name means common. This is a well-known introduction from the old world, and has spread over the temperate regions of the earth. The popular name refers to the hoary appearance. It is perennial, woolly, with much wrinkled, generally round, toothed, opposite leaves. The flowers are white and clustered in leaf angles. The hooks on the calyx assist in the dispersal of the seeds. The plant is occasionally used as a domestic bitter.

III.—Plants not Proclaimed, but more or less Widely Spread, and in Greater or Less Degree Troublesome.

**Acæna ovina*. A. Cunningham. Sheep Burr. Order, Rosaceæ: The Rose family. The generic name is from the Greek *akaina*, a goad, and refers to the spiny fruitlets. The specific name from ovis, a sheep

(Latin), indicates the supposed fondness of sheep for this species. This is an erect, perennial native plant. The paired leaflets are provided with silky hairs, especially beneath. Fruitlets covered with short, irregularly arranged, barbed prickles which attach to sheep, and depreciate the value of the wool. Another species, *A. Sanguisorba.* Vahl. is a great nuisance in parts of the State, especially along the coast.

**Amaranthus albus.* L. White Amaranth. Order, Amarantaceæ. The name of both order and genus is from the Greek *amarantos,* unfading, in reference to the lasting character of some of the flowers included. The second name refers to the somewhat white colour of the branches. This erect, branched, light-green annual is a native of North America. The leaves are alternate, usually oblong, and the midrib projects beyond the blade into a point. The flowers are minute, and destitute of petals. The seed is round and glossy, like a tiny glass bead. It is known as Tumble Weed in America.

**Amaranthus viridis.* L. The Green Amaranth is sometimes claimed as a native. It is widely distributed in warm and temperate regions. Most specimens are erect with purplish stem. The leaves are thin, oval, pale green, lighter below, with prominent veins. The flower clusters are green. This is a common garden and wayside weed. The young shoots can be eaten like spinach.

**Anagallis arvensis.* L. Pimpernel. Order, Primulaceæ: The Primrose family. The generic name is from the Greek *anagelao,* to laugh aloud. The ancients regarded the Pimpernel as an infallible cure for despondency. Its liking for cornfields is indicated in the second name. This is a well-known little European annual, with branched, four-sided procumbent stems, opposite leaves and red flowers. For protection the flowers close with humidity, hence the plant is called the Shepherd's Weather Glass.

"Closed is the pink-eyed Pimpernel

. . . . . .

'Twill surely rain I see with sorrow."

The Pimpernel possesses poisonous properties. A blue-flowered variety *A. cærulea* may often be seen.

**Bartsia latifolia.* Sibthorpe. Common Bartsia. Red Nettle (Local). Order, Scrophulariaceæ: The Foxglove family. Linnaeus named this genus in honour of his friend Dr. Bartsch. *Latifolia* means broad-leaved. This small annual is from the Mediterranean region, and has reddish stem, leaves, and flowers. It is partly parasitic on the roots of grasses. The plant is widely spread in pastures on both sides of the Murray.

**Bulbine bulbosa.* Haworth. Yellow Grass Lily: Wild onion. Order, Liliaceæ: The Lily family. The derivation is the Greek *bolbos,* a bulb. This handsome yellow-flowered native plant has leaves resembling those of the onion. When broken, a glairy, slimy liquid exudes from the leaves. The filaments are all bearded. Though no poison has been determined, this plant is responsible for considerable mortality among lambs in this district. The symptoms are vertigo, scouring, and discharge of greenish mucous from the nostrils. Five grains of potassium permanganate are usually efficacious in promoting recovery, if the administration is not too long delayed. Breaking up the land is the only way to eradicate this pest.

**Capsella, Bursa-pastoris.* Moench. Shepherd's Purse. Order, Cruciferæ: The Cabbage family. The generic name compares the seed vessels to a small capsule (Latin *capsula,* a small box or capsule). The specific and popular names are identical. This is an introduction from Europe, and is a very common annual with erect stem, and rosette of basal leaves. The tap root is long, flowers white, pods flattened and triangular. The plant seeds freely, and several crops are produced in a season. It causes taint of milk when freely eaten by dairy cattle. The Shepherd's Purse is subject to a fungus, *Cystopus candidus,* which may be communicated to the many economic plants of this order, and is suspected of also harbouring the fungus responsible for club-root of Cabbage.

**Cerastium vulgatum.* L. Mouse-ear Chickweed. Order, Caryophyllaceæ: The Pink family. The generic name is from the Greek *Keras,* a horn from the shape of the seed vessels. The specific name signifies common. This is an almost cosmopolitan, and also a very variable plant. It is an annual or biennial, much branched, hairy and usually quite clammy, causing insects to adhere. It resembles the common chickweed, except it is coarser and pubescent. The stem leaves are sessile, but the radical leaves are stalked. The flowers are inconspicuous; the notched white petals are not usually longer than the sepals. The capsule is horn-shaped and projecting, whence name of genus. This is a common weed of gardens, &c., but is easily controlled.

**Chenopodium album.* L. Fat-hen or White Goosefoot. Order, Chenopodiaceæ: The Saltbush family. The name is from the Greek, *Chen,* goose; *pous, podium,* foot; the leaves resembling web-feet. This introduction from the Old World is an erect, rather robust annual. The leaves and whole plant when young are furnished with a mealy, white covering suggesting the specific name. The flowers are green and inconspicuous. The young shoots may be used as a substitute for spinach. This is a common weed of gardens, &c. Cattle will eat it, if compelled, but it is indifferent fodder. **C. carinatum.* R. Brown.—Named from its keeled perianth (Latin, *carina,* a keel); is a common prostrate, hairy, odorous, native plant that has become a troublesome, useless weed, and is spreading. **C. glaucum.* L.—Gets its name from the bloom with which it is covered (Latin, *glaucus,* bluish-grey). This plant is of a more or less prostrate habit, with rather thick leaves. It has no fodder value. **C. murale.* L. (Latin. *murale,* pertaining to a wall), is named from its habitat. This is also called Fat-hen. It is an erect plant with branched, reddish, stems; leaves green on both sides, though sometimes mealy underneath, and called from their shape the "Nettle-leaved Goosefoot."

**Cichorium intybus.* L. Chicory or Succory. Order, Compositæ: The Daisy family. The Arab name *Chicourey* has been adopted with slight alterations. *Intybus* was the original generic name. This is an erect, branched, tall perennial, indigenous to Europe, Asia, and North Africa. The flowers are large, pretty, blue coloured, and usually close at night. It is cultivated to obtain the root to mix with coffee, and is an "escape" which has degenerated and spread. As far back as Virgil's time it was regarded as a weed, for he writes, "Spreading succory chokes the rising field." The blanched leaves are used as salad in France under the fanciful name of "barbe de Capucin." Chicory, Endive, and Dandelion formed the "bitter herbs" of Scripture.

**Cynodon dactylon.* Persoon. Couch grass. Order, Gramineæ: The Grass family. This plant is sometimes called Dog's Tooth Grass, which is a literal translation of its generic name—from Greek, *Kuon,* dog; *odous, odontos,* tooth. The specific name is in allusion to the finger-like form of spikes. This is a well-known cosmopolitan grass with creeping, rooting stems, both above and below ground. The leaves are rather short and sometimes glaucous green. The finger-like spikes are often purplish from the colour of the anthers. In pastures in this and similarly dry districts this grass provides useful fodder. It makes a good

Fat-hen or White Goosefoot (*Chenopodium album.* L.).

lawn grass, but becomes discoloured in winter. In vineyards and gardens it is a troublesome weed, and as every portion of the underground stem will grow the difficulty of eradication is increased. It is considered sacred by the Hindoos, who use it for ceremonial purposes.

**Erodium cicutarium.* l'Heritier. Stork's-bill. Order, Geraniaceæ: The Geranium family. The name of the genus is from the Greek, *erodios,* a heron, from the resemblance of the fruits to that bird's head and beak. The specific name, from the Latin *cicute,* hemlock, refers to the

resemblance of the leaves. This is another annual or biennial from the Mediterranean region. It is a small, pink-flowered plant with finely-divided leaves, and possesses a slight fodder value. It is known in America as Alfilaria, a Spanish-Mexican name, from its pin-like seed points. The seeds are pointed, and have a corkscrew action. The Musk Erodium*, *E. moschatum*, l'Heritier, can be recognised by its musky smell, which deters cattle from eating it. The endemic blue-flowered *E. cygnorum*, Nees, has a better reputation as a fodder plant.

**Euphorbia Drummondii*. Boissier. Flat Spurge. Order, Euphorbiaceæ: The Castor Oil plant family. The first name is that of the Greek physician Euphorbus, who first used an allied plant in medicine. The specific name is in honor of James Drummond, a West Australian

Flat Spurge (*Euphorbia Drummondii*, Boissier).

botanist. Flat spurge is a prostrate little plant with branched stems, milky sap, small, opposite leaves, and reddish or purplish glands. This is now a very common weed of arable and pasture lands. It has been accused of poisoning stock, but, apparently, without sufficient justification, as stock eat it without injury. Occasionally this plant is used in bush medicine in Queensland, where the allied *E. pilulifera L.* is known as Asthma herb. The order has a reputation for acrid and poisonous properties.

Foeniculum vulgare, Miller. (*F. officinale*, *Allioni.*) Fennel. Order, Umbelliferæ: The Carrot and Parsley family. The generic name was long ago in use in the Latin, and is thought to be a diminutive of *fœnum* hay from a fancied resemblance in smell. This plant from the Mediterranean region is a garden escape on the Wahgunyah-road, and a few

other localities. It is a tall, yellow-flowered plant with finely-divided leaves. There is no difficulty in recognising it by its strong smell. The young shoots are used boiled as a vegetable, or even when young used as salad. Portions of the plant are also used as ingredients in sauces and condiments. Longfellow's poem refers to the ancient belief that fennel would restore lost vision, and give the gladiators strength.

**Fumaria officinale.* L. Fumitory. Order, Fumariaceæ. The generic name is from *fumus*, smoke, from the smell of the bruised plant. Ancient writers affirm the name is from *fumus terræ*, and allege the plants sprang from the "fumosity of the earth." This is another introduction from the Old World. It is a prostrate, straggling, spreading plant with much divided, pale-green leaves with flat, almost prehensile segments. The rather pretty pink flowers are borne in racemes. In the southern part of the State it has spread rapidly over considerable areas of arable land. The seeds retain their vitality for a long time. At Mudgee, New South Wales, it has been reported to smother a wheat crop. Even in the time of Shakespeare it was a well-known weed, for he has several references to it.

**Heliotropium europæum.* L. European Heliotrope. Order, Boraginaceæ: The Heliotrope family. The generic name is from the Greek *helios*, the sun, and *trope*, a turning towards. As observed by Dioscorides and Pliny, the flowers turn sunwards. The specific name indicates its European origin. It is native of the Mediterranean region. This is an erect, branched, hairy annual. The leaves are oval, often undulate, on rather long stalks, grey-green in color, and show the veins prominently underneath. The flowers are creamy white, borne on one-sided bractless spikes, of which the terminal ones are usually paired. This is a fairly common weed, which is spreading on the river flats at Goorambadda.

**Hypochæris radicata.* L. Flatweed. False Dandelion. Order, Compositæ: The Daisy family. The generic name is from *hypo*, for, and *choires*, a pig (Greek), because these animals are fond of the roots; c.f., French name Porcelle. The specific name refers to its deep roots. Native to the Mediterranean region, this plant has spread almost everywhere. It is a perennial, with hairy leaves forming a rosette on the ground. The flowers are large and the flowerheads are borne on long stalks. *H. glabra* is a smaller weed, and is without the hairy leaves, as its name indicates.

Lactuca scariola. L. Prickly Lettuce. Order, Compositæ: The Daisy family. The name is from *Lac*, milk, from the milky juice of these plants. *Scariola* is the old generic name indicating its prickly character. This is a very tall, erect, annual or biennial, of which the lower stem, leaf-margins, and midrib are furnished with prickles. The leaves are not lobed, and clasp the stem by an arrow-shaped extension at their base. The leaves have a tendency to grow in a north and south direction, and this has earned for the plant, with others, the name Compass plant in America. Native originally of the Mediterranean region, it has spread nearly all over the world. It is regarded as the original whence all our varieties of lettuce have been derived. It is not common, but appeared near Chiltern, where "sparrows in flocks devoured the seed, and so reduced the pest considerably" (Anderson).

**Lactuca saligna.* L. The Willow Lettuce is occasionally seen. It is a more slender, often branched plant, with pinnatifid leaves and without the prickles characteristic of the former species. Sheep seem to appreciate this plant in droughty seasons.

**Lepidium campestre.* R. Brown. Field pepper grass. Cow grass in America. Order, Cruciferæ: The Cabbage family. This native of Europe is a strong-growing annual or perennial of downy appearance. The stem is erect and much branched above. The basal leaves are usually stalked; the stem leaves are arrow-shaped and clasping. The flowers are inconspicuous, white or yellowish in colour. The winged seed vessels are spoon or boat shaped, being hollowed on one side, and are notched at the summit. The seeds are fairly large, oval in shape,

The Willow Lettuce (*Lactuca saligna*, L.).

and brown in colour. They become shiny when wetted. The species name indicates the favorite habitat of this species, which is never likely to cause serious trouble like the following.

**Lepidium draba.* L. Hoary Cress. Order, Cruciferæ: The Cabbage family. The generic name was used by Dioscorides from Latin *lepis*, a scale, from the scale-like shape of seed vessels. Fuchs, however, says the name was given because the plant was used to remove scales and spots from the face. *Draba* is an old Greek name for a kind of cress. The hoary cress is a native of Europe, Asia, and North Africa. It is a perennial, downy-white plant, with robust branched stems. The upper leaves clasp the stem by an arrow-headed base; the lower leaves are stalked. The flowers are creamy or dirty white, and the seed vessels heart-shaped. This is a very serious pest, as almost every portion of the

root will grow, and, being a deeply-rooted plant, it is most difficult to eradicate. An old plant was found in the College Farm, having come from Werribee.

**Lepidium ruderale*. L. The Waste Places Cress, as it is popularly called in Queensland, is a native. As its name indicates (*rudera*, rubbish), it is found on waste places, where it is a common weed. It is rather tall, occasionally hairy, basal leaves soon dying. The flowers are minute and destitute of petals, seed vessels oval, notched at top, and borne in racemes. This is a very variable plant, some specimens being almost spiny.

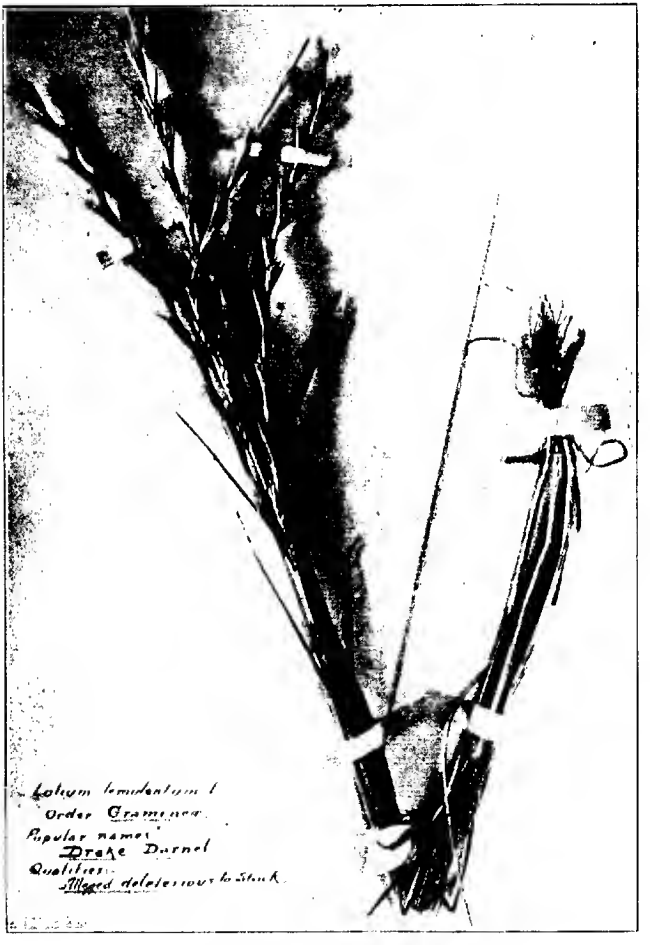
**Linaria elatine*. Desfontaines. Hairy Toad Flax. Blanket Weed (Local). Order, Scrophulariaceæ: The Foxglove family. The genus gets its name from its resemblance to flax (*Linum*). This is an annual,

Hairy Toad Flax or Blanket Weed (*Linaria elatine*, Desfontaines).

prostrate, hairy or woolly, with yellow flowers. Has not been long naturalized in the district, but is spreading, and is a useless, troublesome weed. The prefix of an animal name is common in English plant names, *e.g.*, horse-chestnut, dog-rose, toad-flax. The prefix toad in the common name refers to the spurious character of the plant compared with the true flax.

**Lithospermum arvense*. L. Iron weed. Corn Gromwell. Order, Boraginaceæ: The Borage or Heliotrope family. The generic name is from the Greek *lithos*, stone, *sperma*, seed, from the hard seeds and their polished appearance. The specific name refers to its presence in cornfields. This is a small, erect, branched annual, grayish in colour and rough in appearance, owing to the presence of minute hairs. The flowers are small, funnel-shaped, with five rounded lobes, and of a

creamy-white colour. The hard seeds retain their vitality for a considerable time. This plant, which is a native of Europe, Asia, and North Africa, is common in wheat-fields. It is called Stoneseed and Wheat-thief in America.



Drake. Darnel (*Lolium temulentum*, L.).

**Lolium temulentum.* L. Drake. Darnel. Order, Gramineæ: The Grass family. Lolium is the old Latin name for Darnel, Cockle, and Tares. The specific name means intoxicated, and refers to the alleged properties of the seed. Gerarde (1597) says, "New bread, wherein

Darnel is, eaten hot, causeth drunkenness." Rye grass (originally ray grass) is from the French *Ivraie*, darnel, which, in turn, is derived from *Ivre*, drunkenness. The alleged poisonous properties of Darnel are now generally believed to be due to a fungus. The common name Drake is a modification of a very old English word referring to this and other weeds of corn-fields. This is the "tares" of the New Testament.

**Lythrum hyssopifolia*. L. Hyssop-leaved—or Small—Loose-strife. Order, Salicarieæ: The Loose-strife family. The name is from *Lythron*, a Greek term for blood, and is in reference to the color of the flowers of the early-known species. The specific name refers to the resemblance of the foliage to that of hyssop. This is a native, and, in fact, almost a cosmopolitan plant. Its inclusion here is due to the fact that several inquiries have been made regarding it by local farmers. The Small Loose-strife is a prostrate, diffuse plant, with ascending tip, and has a partiality for damp places. It is common along creeks and drains, and has spread somewhat extensively in pastures on flats or low-lying land. The prostrate stems form roots. The leaves are small and narrow, opposite on lower, and alternate or scattered on upper, part of stem. The flowers are solitary, small in size, and pink in colour. They are borne in the axils of the leaves. As this plant seeds very freely, it may spread rapidly if neglected, but can be readily controlled.

**Malva parviflora*. L. Small-flowered Mallow. Order, Malvaceæ: The Mallow family. Malva is the Latin name, probably from Greek *malasso*, to soften, from its emollient properties. This is a well-known annual weed from the Mediterranean region. The stem is often branched, leaves roundish, leaf stalks downy, flowers small and pink. The fruits of the Mallows are called "cheeses" and are eaten by children in England. Mallow shoots are sometimes used as a pot-herb.

**Malva rotundifolia*. L. Dwarf Mallow. The specific name refers to the round leaves. This is also a common farm-yard weed.

Melissa officinalis. L. Balm. Order, Labiatæ: The Mint and Sage family. The name is from the Greek *melissa*, a bee, from its honey-yielding property, and Latin *officinalis*, pertaining to a shop. This well-known native of Southern Europe and Western Asia should, perhaps, hardly be included as a weed. It is a garden escape in a few places, and is a perennial, odorous, branched, and often downy herb. The leaves are stalked, wrinkled, oval in shape, with toothed edges. The flowers are white. It yields a volatile oil, faintly resembling lemons. French name *citronelle*. When in bloom the plant is much frequented by bees.

**Modiola multifida*. Moench. Red-flowered Creeping Mallow. Order, Malvaceæ. The generic name is the Latin for the nave of a wheel, and records the fancied resemblance of the whorled carpels to a wheel. The specific name is in allusion to the leaf divisions. This American plant is a creeping perennial, slightly hairy. The stems form roots at the joints. The flowers are red. This weed was introduced into Queensland with packing round trees. It is of no value as fodder, but stands drought well, and crowds out useful pasture plants.

Oenothera biennis. L. Evening Primrose. Order, Onagrariaceæ: The Fuchsia family. The genus gets its name from the Greek *Oinos*, wine, *thecao*, to pursue eagerly. It was alleged eating the roots was an incentive to wine drinking, but others say it dispelled the effects of wine. This is a garden stray, and is a North American native. It is a tall biennial with somewhat downy, often reddish stems. Leaves lanceolate,

with prominent white midrib, waved margins with small teeth. The large bright yellow, fragrant flowers are mostly fertilized by twilight-flying insects, especially in the early season. Later the plants keep "open house" practically all day. In America it is considered a troublesome pest. Here it is not formidable, and is practically confined to the railway reserve near Lilliput and Rutherglen. It has also been noticed near Wahgunyah.

**Oxalis cernua.* Thunberg. South African Wood Sorrel. Order, Geraniaceæ: The Geranium family. The generic name is from the Greek *oxys*, sharp or sour, from the acid taste of leaves; *cernua* means inclined, nodding. This is a South African plant, and is a garden escape. It is a bulbous plant with basal leaves, consisting of three leaflets. The umbels of pretty yellow flowers droop, hence its specific name. As it reproduces by bulbs as well as seeds, it spreads rapidly. Sparrows have

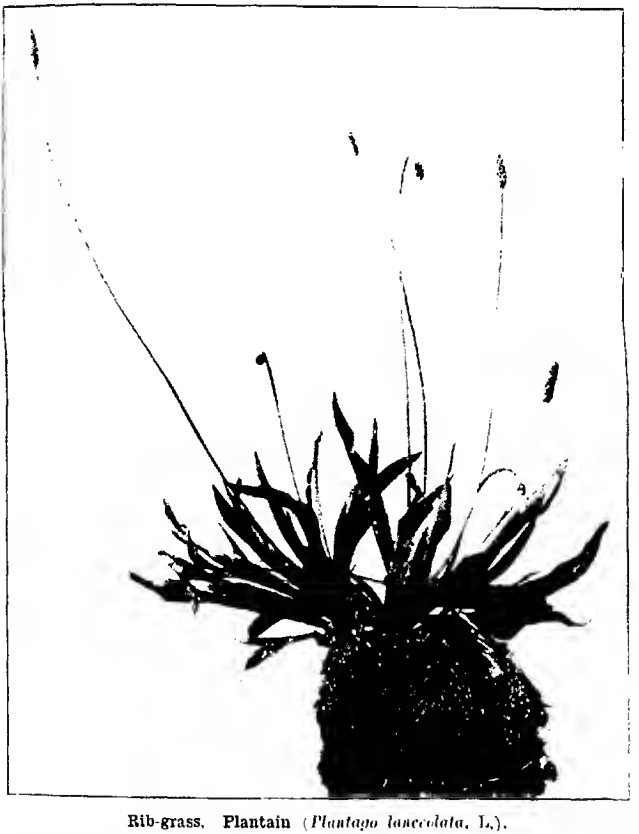
Red-flowered Creeping Mallow (*Modiola multifida*, Moench).

been credited with spreading the bulbils. This is a very troublesome weed, which should be given no quarter.

**Papaver hybridum.* L. Poppy. Order, Papaveraceæ. The generic name is the very old Latin one, and refers to the thick, milky juice which forms opium. This is an introduction from Europe and Asia. It is an annual, erect, hairy; with milky sap, divided leaves, and red flowers, and is easily recognised by its hairy seed vessel. In olden times the poppy was regarded as the symbol of fecundity, hence it was not considered the crops would be good unless plenty of poppies grew among them. Modern agricultural science has dispelled this and other myths. The plant is not at all common here.

**Plantago lanceolata.* L. Rib-grass. Plantain. Order, Plantaginaceæ. The generic name is Pliny's, said to be from the Latin *planta*,

the sole of the foot, perhaps in reference to its way-side growth in well-trodden situations. The specific name refers to the spear-shaped leaves. Rib-grass is a well-known plant that has spread from Europe and Asia almost everywhere. The leaves, which are covered with very fine hairs, spring from the base, and have a prominent midrib with two conspicuous veins on either side. The inconspicuous individual flowers are crowded into a spike on long flower stalks. This plant will grow in dry and



Rib-grass. Plantain (*Plantago lanceolata*, L.).

rather barren spots, and is sometimes recommended in grass mixtures, but its slight fodder value does not compensate for the room it takes. In Ohio it "ranks among the worst weeds."

**Polygonum aviculare*. L. Hog-weed. Wire weed. Order, Polygonaceæ: The Rhubarb and Dock family. The genus is named from the Greek *polys*, many, *gonu*, a knee, or a knot in a reed, and applies to the many-jointed stems. The specific name, from a diminutive of *avis*,

a bird, refers to it as a bird food. This weed has found its way from Europe, Asia, and Africa over the whole world. It is a prostrate annual with wiry, jointed stems, inconspicuous white flowers, and is a common weed of cultivated land, paths, and waste places. Yields a welcome, if not very nutritious, food for stock.

**Portulaca oleracea.* L. Purslane. Pig-weed. Order, Portulaceæ. Some writers give the origin of this ancient name from *porto,* to carry, *lac.* milk. Baron von Mueller says Pliny "derived it from the form of the leaves, door-shaped in miniature." The specific name indicates its edible character as a vegetable. This is almost cosmopolitan, and was used as food by the ancients. Australian explorers attribute good health to eating plenty of this plant. It is an annual, prostrate plant, stems reddish, especially towards base, both stems and leaves fleshy. The

Purslane. Pig-weed (*Portulaca oleracea,* L.).

flowers are small, and the yellow petals soon fall. Natives ate the tiny seeds, and the plant is a good substitute for spinach.

**Rumex acetosella.* L. Sorrel. Order, Polygonaceæ: The Rhubarb and Dock family. The generic name is a very ancient one, and is "in allusion to some faint resemblance of the leaves to the old Roman war arms." The specific name refers to the sourness of the plant. Of European and Asiatic origin, this plant is now distributed in all temperate regions. Sorrel is a slender, erect plant, with creeping underground stems. The leaves are spear-shaped, or more like the ancient halberd. The flowers are tiny, and the male and female parts are on different plants. It is a troublesome weed, whose presence is an indication of sourness in the soil, and absence, or scarcity, of lime. Sorrel is occasionally eaten as a salad or cooked as a vegetable. To this genus belong the well-known Docks.

**Rumex conglomeratus.* Murray. The Clustered Dock is a well-known perennial weed. All the Docks enumerated are from Europe and Asia. **R. crispus*, L.—The Curled Dock has leaves with undulated margins. **R. obtusifolius*, L.—The Broad-leaved Dock has broad, blunt leaves. **R. pulcher*, L., is called the Fiddle Dock, from a fancied resemblance to a violin in the shape of leaves. Docks are common, but only serious in this dry district in moist situations.

Salvia verbenaca. L. Wild Sage. Order, Labiatæ: Mint and Sage family. The generic name is from the Latin *salveo*, to be in good health, from the reputed curative powers of some salvias. The specific name refers to the resemblance to a verbena. This is a native of Europe and Asia, and is an erect, branched, strong perennial, hairy-stemmed, and odorous. The leaves are opposite, and vary in shape from oval to oblong, wrinkled, somewhat lobed with rounded teeth (crenate). The flowers are blue in colour and small in size. This is quite useless, and is likely to become a troublesome weed if allowed to spread, as it appears to be doing in local pastures.

**Scabiosa maritima.* L. Pincushion. Order, Dipsacaceæ: The Teasel family. The genus received its name from its reputed efficacy in cutaneous diseases (Lat. *scabies*, itch, leprosy). This is a tall annual or perennial. The flowers popularly known as pincushions, and are from white to deep red or purple in colour. This is another garden escape. The only specimens seen in the College grounds were just outside the garden a few years ago. It is common in parts of the borough. In some districts it becomes a troublesome weed.

**Sherardia arvensis.* L. Field Madder. Order, Rubiaceæ: The Madder and Coffee family. This small, slender annual is a native of the Mediterranean region. It is grayish-green in colour, with sometimes almost a bluish tinge. The stems are four-sided, rough and procumbent. The leaves are in whorls of usually six, though frequently four on lower stem. The flowers are minute, terminal, funnel-shaped, lilac in colour, surrounded and exceeded by an involucre. The conspicuous calyx teeth persist on the fruits. The generic name is in honour of Wm. Sherard, an English botanist, and its species name indicates its predilection for cultivated land. This is a small, widely-spread weed, unlikely to cause much trouble.

**Spergula arvensis.* L. Corn Spurry. Order, Caryophyllaceæ: The Pink family. The genus gets its name from the Greek *speiro*, to scatter seed (Latin, *spargo*). This is a small, slender annual from the Mediterranean region, sometimes downy. The leaves are linear, unequal in size, and grooved below. They are arranged in two opposite clusters, and thus resemble a whorl. The flowers are white. As its specific name indicates, this is a common weed of cornfields, where, if very abundant, it is a menace to the young, growing crop.

**Spergularia rubra.* Persoon. Sand Spurry. Order, Caryophyllaceæ: The Pink family. This genus is named from its resemblance to *Spergula*, and the specific name indicates the colour of the flowers. This is a common wayside annual or biennial, frequently downy in appearance and clammy to the touch. The narrow linear leaves are provided with conspicuous, dry, thin, membranous stipules, and the flowers are red or pink.

**Silene gallica.* L. French Catch Fly. Order, Caryophyllaceæ: The Pink family. The derivation is from the Greek *sialon*, saliva, from the gummy secretion which earns for this plant its popular name. The specific name indicates its French origin. This is an introduction from Europe, which has spread almost all over the globe. It is a small, erect, hairy, sticky annual, with pink or whitish flowers usually turned one way. Tiny ants seem more often caught by this plant than flies. It is common along fences, headlands, &c., but is not a serious pest.

**Sisymbrium officinale.* L. Hedge Mustard. Order, Cruciferæ: The Cabbage family. *Sisymbrion* was a Greek name given to some fragrant aquatic plant not now recognised. This common way-side annual is native to Europe and West Asia. It is an erect, tall, somewhat downy plant, with stiff branches spreading horizontally. The flowers are inconspicuous, and of a light yellow colour. The seed vessels are short, tapering, downy, sharply-pointed at tip, and closely pressed when ripe to the leafless stem.

**Solanum nigrum.* L. Black Nightshade. Order, Solanaceæ: The Potato family. The generic name is from *solor*, to soothe, from the narcotic properties of genus and order. The specific name refers to the black berries. This is a cosmopolitan plant, claimed often as indigenous. It is an erect, branching, dark-green annual with small white flowers and black berries. Dioscorides attributed poisonous properties to this plant, a character it still retains, even if unjustly. It is a common vineyard weed of late years. The Wonderberry, an alleged hybrid between *S. guineense* and *S. villosum*, cannot be botanically distinguished from this weed.

**Sonchus oleraceus.* L. Sow-thistle. Order, Compositæ. *Sonchos* is the Greek name of this plant, probably from *samphos*, hollow, spongy, from its stems. The specific name refers to its use at one time as a vegetable. This is a well-known cosmopolitan weed. It is an erect annual with hollow stems and milky sap. The upper leaves clasp the stem. There are prickles on the leaf margins. The flowers are yellow. It is not a serious weed, and is readily eaten by stock.

**Stachys arvensis.* L. Hedge Nettle. Field Stachys. Stagger Weed. Order, Labiatæ: Mint and Sage family. The name is from the Greek *stachys*, a spike, from form of inflorescence, while the specific name refers to its partiality for arable land. This is a native of Europe, and is a dwarf, hairy, decumbent annual. The leaves are stalked, oval in shape, and with round-toothed margins. The small, pale purple flowers are borne in the axils of the leaves. Its popular name, "Stagger Weed," is from an unjustifiable statement that it is the cause of staggers in animals.

**Stellaria media.* L. Chickweed. Order, Caryophyllaceæ: The Pink family. The generic name from Latin *stella*, a star, alludes to the form of the flowers. Originally native to Europe, Asia, and North Africa, this plant is now found practically all over the world. It is a weak-stemmed, branching annual with small star-shaped white flowers. This species is easily recognised by the single line of short, white hairs running from node to node along the side of the stem. It is commoner in moister districts than ours. When cooked, it is claimed to be an excellent substitute for spinach.

**Taraxicum officinale.* Weber. Dandelion. Order, Compositæ: The Daisy family. The generic name is probably from the Persian or Arabic

name of this plant, though sometimes considered to be derived from the Greek *tarasso*, to agitate, from its reputed medicinal qualities. This is another introduction from the Old World. It is a perennial, with a stout, penetrating root, used in medicine. The leaves are basal, and form a rosette on the surface, are often saw-toothed, and sometimes hairy. The flower heads are solitary, borne on a hollow flower stalk called a scape, and the flowers are yellow. It is commoner in moister climates. When the Normans went to England with William the Conqueror they fancied the curved leaf points were like lions' teeth (dents de lion), whence our popular name. The original generic name was *leontodon*, from the same fancy.

**Tunica velutina*. Fischer and Meyer. Velvet Carnation. Order, Caryophyllaceæ: The Pink family. The generic name is from the tunic-like calyx. The plant is a variety of *T. prolifera*. This plant is fairly common, but not at all troublesome. It may be recognised by its pink-coloured flowers on rather long stalks, and its resemblance to the carnation family.

**Urtica dioica*. L. Tall Nettle. **U. urens*. L. Dwarf Nettle. Order, Urticaceæ. The name of the order and genus is from the Latin *uro*, to burn, from the stinging properties; *dioica* is from the Greek *dis*, two, *oikos*, a house, because the male and female parts are on separate plants. When the pollen is ripe the male flower bursts, and ejects the pollen into the air for the wind to carry to its destination. The word nettle is the same as needle. These plants follow man everywhere. They are too well known to need description, and, as Culpeper, the old herbalist, says, "They may be found by feeling on the darkest night." The Australian tree nettle, *Laportea*, is a formidable and dangerous plant. It is always puzzling to the young botanist to be told that the nettle family includes such plants as elms, figs, mulberries, hops, and hemp.

**Verbascum blattaria*. L. Moth Mullein. Order, Scrophularineæ: The Fox-glove family. The generic name is a corruption of Pliny's name for the plant Barbascum, from the bearded stamens and leaves. *Blatta* is the cockroach which the plant is said to repel, just as it is said to attract moths. The tall flower stalk of this biennial springs from a rosette of dark-green basal leaves. The flowers are generally yellow, the succeeding seed vessels globular, and of the size of garden peas.

Verbascum thapsus, L., is a tall, woolly-leaved, yellow-flowered biennial. Neither is common, and both are probably garden escapes.

Verbena venosa. Gillies and Hooker. Veined Vervein. Order, Scrophulariaceæ: The Fox-glove family. De Theis says that Verbena is from its Celtic name *ferfain*. The specific name is in allusion to its conspicuous leaf veins. Flowering shoots rise from a creeping stem under the surface. The leaves are opposite, rough, and hairy, with prominent veins. The flowers are purple. Colonies of this weed form a dense mass on the ground if unchecked. It has appeared in two or three widely-separated places in the district.

**Vittadenia australis*. A. Rich. Order, Compositæ: The Daisy family. The genus was named in honor of C. Vittadini, a botanical author. This is a dwarf native annual, or sometimes perennial, with much branched stems covered with hairs. The flowers are blue. It is a common weed of pastures, and is spreading.

**Vinca major*. L. Blue Periwinkle. Order, Apocynaceæ. The genus name is from Latin *Vincio*, to bind, from the twining shoots. This

is a garden escape, hardly yet troublesome. The long, trailing stems root at the nodes. It has also vigorous underground stems, so that if it once got established it would be hard to eradicate.

In addition to the above, there are a few grasses that have become naturalized, and which are either useless or injurious. The Silvery Hair Grass (*Aira caryophyllea*, L.) is a delicately pretty grass, rather common, but of no economic value.

**Avena fatua*, L., is the Wild Oat, which may be distinguished from the cultivated variety by the brown hairs on base of flowering glume and stalk, and the strong, bent awn. This is a well-known weed among cereals. The seeds shed early, and so foul the land for subsequent crops, as they retain their vitality for some time in the soil. In its favor it may be said that the wild oat furnishes fodder of some little value. The perennial wild oat is *A. pratensis*, L. Two varieties of Quaking Grass, **Briza maxima*, L., and **Briza minor*, L., are very common. They are ornamental, but of little fodder value.

There are several Brome grasses. The well-known and useful prairie grass is *Bromus unioloides*. Others of the same genus, however, are of little use. The sterile Brome, **Bromus sterilis*, L., is one of the Spear grasses whose seeds are dangerous, and the plant has no fodder value. **B. madritensis*, L.—The Madrid, or compact Brome, stands drought well, but is not appreciated by stock. **B. mollis*, L.—The Soft Brome, is rather handsome, but valueless as fodder. It is frequently the host of a fungus.

**Hordeum murinum*, L. The Barley grass is of little fodder value, dying early, and obnoxious on account of its sharp seeds. *H. pratense*, Hudson, the meadow Barley grass, is found on river flats. The knotted Barley grass is *H. secalinum*, L. All have troublesome seeds.

Several species of *Stipa*, popularly known as Speargrass, are decidedly injurious, as the sharp, corkscrew seeds actually penetrate the skins and injure the eyes of sheep. *S. setacea*, R. Brown, *S. semibarbata*, R. Brown, *S. pubescens*, R. Brown, are all recorded from this district.

Representatives of the genus *Aristida* are, if anything, still more dangerous when seeding. The three-pronged, pointed awns are a menace to the sight, and even the lives, of sheep.

A TEST OF COMMERCIAL FERTILIZERS FOR GRAPES.

The treatment consisted in the annual applications of nitrogen in the form of sodium nitrate, dried blood, and cotton-seed meal, of phosphorus as superphosphate, of potassium as potassium sulphate, and of lime. Nitrogenous fertilizers had a marked beneficial effect upon the yield and quality of the fruit, leaf, and wood growth, whereas lime had no effect, and phosphorus and potassium so little that the use was not profitable. To restore a failing vineyard, the steps required in the usual order of importance, are to secure a good drainage, control insects, and fungi, improve the tillage and general care, apply such fertilizers as may be found lacking, nitrogen being probably most frequently the element needed.

—U. P. HEDRICK and F. E. GLADWIN. New York Agricultural Experimental Station. Bull. 381, March, 1914.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

CULTIVATION.

The necessity for constant surface cultivation is apparent every summer, but more so in dry seasons. Not only in non-irrigable districts is this a necessity, but also in those districts where the trees can be watered, and more so in the latter case. In irrigated orchards, the tendency of the soil, as a result of artificial waterings, is to set and harden. Consequently, stirring the surface must be resorted to, in order to keep up a good mechanical condition of the soil, and also to prevent loss of irrigation water by evaporation.

In non-irrigated orchards, the cultivation work is necessary to conserve what water has entered the subsoil as a result of the winter and spring rains. Soil crusts should not be allowed to form. Summer showers are not alone the cause of these formations; dry weather conditions cause the soil to consolidate, and any trampling or vehicular traffic tend to harden the surface, and thus to allow the escape of moisture that the trees most need.

PESTS AND SPRAYING.

If woolly aphis is at all existent, a spraying with a strong nicotine solution, or with the lime sulphur spray, will keep it in check for the summer.

Codlin moth spraying will still have to be carried on. All affected apples should be gathered and destroyed. None should be allowed to remain on the trees or on the ground. As soon as the workings or marks of the insect are observed, the fruit should be gathered and destroyed. If the fruits are left there is always the danger of the larvæ escaping to a crevice or hiding-place, and so continuing the loss.

Cherry and pear trees may be sprayed with arsenate of lead wherever the slug is present; vines may be sprayed similarly wherever the vine moth caterpillars are found.

BUDDING.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked over towards the end of the month. It is advisable to select dull, cool weather for this operation, so that the sap may run more freely, and the weather will not have a too drying effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be freely flowing, so that when the cuts are made the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres; and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature growth whatever. It is cut from the scion with a shallow cut, and if any wood in the cutting be left in, this should be taken out of the bud. A smooth clean spot should be selected on the bark of the stock, and a T-shaped

cut made; the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised and the bud inserted between the bark and the wood of the stock. The bud should be gently pushed down into position, and it should then be bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level with a horizontal cut. With practice it will soon become possible to cut buds that will need neither cutting nor trimming. After two or three weeks the buds may be examined to see if they have taken, *i.e.*, if the bud has united thoroughly to the stock. When that occurs the tie may be cut. If a growth be desired at once, all wood above the bud may be cut off some short distance above the bud, so as to prevent any bark splitting, and consequently loss of the bud, and also to throw the bud out at a fair angle. Ultimately, this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till this next spring. In this case, the branch above is not cut off, but is left on until the usual winter pruning.

Summer Pruning.

The almost entire absence of a fruit crop has resulted in a vigorous growth in the fruit trees, both of foliage and lateral growth. In order to more economically utilize this abundant growth, it should be now summer pruned, particularly on the apple and pear trees. Care should be observed that as much of the leafage as possible is retained on the trees. Unduly long laterals of fruiting trees may be shortened back, always cutting to a leaf. Unnecessary terminal growths of the leader, of which there are sometimes three or four, all strong growing, may be reduced to one; retaining this one as a leader. In no case should this growth be cut or interfered with in any way.

The result of these cuts will be to divert the sap which was flowing into growths that would subsequently be pruned, into more profitable channels, so that the weak growths and buds may be strengthened, and induced into fruit bearing.

Vegetable Garden.

The vegetable section should be kept in good condition by alternate cultivation and watering. A good surface scarifying with the Planet Jr., or with a hoe, should be given when the soil has well settled after each watering. This will keep the soil in good condition, and the crops in good growth. Where crops are growing, an occasional overhead watering will be beneficial; it will clean and invigorate the leaves.

As soon as a crop has been removed from a plot, the ground should be well manured and dug over. If any pest, such as aphis or caterpillars, has been prevalent, it would be advisable to burn all crop refuse, to destroy any insects that may remain.

Seedlings of such crops as cabbage, celery, lettuce, cauliflower, &c., may be transplanted; and seeds of peas, French beans, turnip, cauliflower, &c., may be planted.

Keep the tomatoes well watered and fed, pinching out surplus and strong-growing laterals. In early districts the onion crop will be ripening. In late districts, or with late crops, the ripening may be hastened by breaking down the top. An autumn crop of potatoes may be planted

Flower Garden.

The lawns, flower beds, and shrubberies will need frequent waterings. Such plants as cannas, delphiniums, perennial phloxes, and pentstemons will require a good water supply. These and similar plants will benefit by a good mulching.

Much hand work will be of great benefit in the flower garden and borders at this season of the year. Regular hoeings do much to improve the texture of the soil and to conserve the soil moisture. In shallow and undrained soils constant waterings will be necessary, if the plants are to be kept alive; at the same time there is always the danger of excessive watering in undrained soils.

Mulching will be an important work this month. This work will greatly assist the retention of soil moisture; at the same time, it will greatly reduce the temperature of the soil. Any material that will ultimately be incorporated with the soil in the form of humus is useful for mulching purposes. Dahlias and chrysanthemums should be kept growing and in good heart by watering, light feeding, and mulching. They should also be tied to the stakes as the growths extend.

Pests, such as caterpillars of several species, and red spider, will now shortly appear. For the former, weak sprayings with arsenate of lead or paris green, may be given. Wherever the red spider is observed, the attacked parts should be cut off and burned. Not only should this be done to the chrysanthemums and dahlias, but also to all plants in the beds similarly affected. Constant waterings will often relieve the plants of this trouble, but the most efficacious method is to burn all parts affected as the insect makes its appearance.

Carnations may now be layered, and seeds of pansies and perennial and biennial plants may be sown. A few late gladioli and a few spring flowering bulbs for early flowering, may also be planted.

SOLUBILITY OF PHOSPHORIC ACID IN ROCK PHOSPHATE.

Recent researches have been made in America on the effect of ensilage fermentation and animal digestion upon the solubility of phosphoric acid in rock phosphate.

The experiment consisted of adding rock phosphate to the green fodder being placed in the silo.

The results were unsatisfactory in that not only did the animals soon refuse to eat the silage, but the solubility of the phosphoric acid in the animal excreta was not increased.—Extract from *Journal Industrial and Engineering Chemistry*, June, 1914.

Victorian soils are deficient in phosphoric acid. On the assumption that if you feed the animal you feed the soil, a successful scheme whereby phosphoric acid in the cheap form of rock phosphate is passed through the animal and returned in the excreta to the soil would, indubitably, tend to increase the phosphate content of our soils.

In the above experiments the phosphate content of the excreta from the animals fed on the phosphated ensilage showed a decided increase over those fed on untreated ensilage, although the solubility was not enhanced.

VICTORIAN WHEAT HARVEST—SEASON 1914-15.

PRE-HARVEST ESTIMATE.

BASED ON INFORMATION FURNISHED BY FARMERS.

Counties.	Estimated Area Sown for Grain.	Estimated Yield of Wheat.	
		Per acre.	Total.
	acres	bushels.	bushels.
Grant	13,200	4·10	54,120
Talbot	22,800	2·50	57,000
Grenville	29,700	10·00	297,000
Hampden	19,200	9·75	187,200
Ripon	73,200	4·50	329,400
Lowan	170,200	2·15	365,930
Borung	380,900	1·10	418,990
Kara Kara	153,100	1·25	191,375
Weeah	162,400	0·30	48,720
Karkarooc	478,000	0·35	167,300
Tatchera	309,500	0·45	139,275
Gunbower	64,400	0·25	16,100
Gladstone	141,900	1·80	255,420
Bendigo	193,700	0·80	154,960
Rodney	147,100	1·25	183 875
Moira	331,700	1·90	630,230
Delatite	16,600	4·90	81,340
Bogong	47,100	4 80	226,080
Other Counties	36,200	7·75	280,550
Total estimated area and yield 1914-15 ...	2,790,900	1·46	4 084,865
Total area and yield 1913-14	2,565,861	12·84	32,936,245

A. M. LAUGHTON,
Government Statist.

Office of the Government Statist,
Melbourne, 1st December, 1914.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

MONTHLY REPORT ENDING 14TH DECEMBER, 1914.

The weather during the past month has been somewhat changeable but on the whole good for egg production.

There has been some heavy rains and some cold snaps, which affected the birds adversely.

The birds are in good health and doing well, although broodies are very troublesome, and some few birds are moulting.

The rainfall for the month was 291 points.

A. HART, Chief Poultry Expert.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914-1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition.			Position in Competition.
			15th April to 14th Nov.	15th Nov. to 14th Dec.	Total to date, 8 months.	
		LIGHT BREEDS				
		WET MASH.				
25	White Leghorns ..	J. H. Gill	1,015	118	1,193	1
36	" ..	E. A. Lawson	1,012	140	1,152	2
26	" ..	Mrs. H. Stevenson ..	909	155	1,064	3
9	" ..	J. J. West	924	130	1,054	4
18	" ..	A. R. Simon	907	147	1,054	5
10	" ..	R. Hay	902	143	1,045	6
17	" ..	F. Doldissen	868	139	1,007	7
33	" ..	W. G. Osburne	858	148	1,006	8
37	" ..	S. Brown	857	127	984	9
4	" ..	Giddy and Son	835	150	985	10
12	" ..	Marville Poultry Farm ..	848	134	982	11
40	" ..	J. Schwabb	862	117	979	12
11	" ..	C. J. Jackson	826	149	975	13
45	" ..	H. C. Brock	845	127	972	14
29	" ..	V. Little	845	126	971	15
44	" ..	A. Ross	840	124	964	16
35	" ..	W. Tatterson	841	119	960	17
23	" ..	S. Buscumb	803	136	939	18
8	" ..	F. W. Brine	767	153	920	19
15	" ..	G. Waldon	802	117	919	20
1	" ..	F. G. O'Bree	775	138	913	21
47	" ..	W. G. Swift	775	131	906	22
28	" ..	Utility Poultry Farm ..	775	122	897	23
30	" ..	G. W. Robbins	760	133	893	24
24	" ..	C. Pyke	747	146	893	25
12	" ..	A. H. Mould	790	89	879	26
34	" ..	W. A. Rennie	751	128	879	27
2	" ..	J. C. Armstrong ..	748	125	873	28
22	" ..	B. Mitchell	748	123	871	29
3	" ..	T. A. Pettigrove ..	780	87	867	30
6	" ..	C. R. Jones	719	141	860	31
38	" ..	G. Hayman	715	139	854	32
20	" ..	A. W. Hall	710	142	852	33
48	" ..	Bennett and Chapman ..	717	131	848	34
14	" ..	F. C. Western	725	109	834	35
13	" ..	H. Hanbury	725	108	833	36
42	" ..	E. W. Hippe	700	128	828	37
32	" ..	Glendell Bros.	686	133	819	38
18	" ..	All-lay Poultry Yards ..	687	123	810	39
31	" ..	E. H. Bridge	659	138	797	40
41	" ..	Doncaster Poultry Farm ..	652	140	792	41
5	" ..	A. Mowatt	647	141	788	42
21	" ..	R. A. Lewis	636	110	746	43
43	" ..	G. Mayberry	607	134	741	44
39	" ..	R. L. Appleford	590	139	729	45
49	" ..	A. Beer	603	116	719	46
50	" ..	F. G. Silbereisen	547	123	670	47
27	" ..	Walter M. Bayles	537	119	656	48
46	" ..	C. L. Sharman	516	113	629	49
7	" ..	B. Cohen	488	138	626	50
		Total	37,881	6,516	44,397	

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914-1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Nov.	15th Nov. to 14th Dec.	Total to date, 8 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		DRY MASH.				
60	White Leghorns ..	W. N. O'Mullane ..	1,095	155	1,160	1
55	,, ..	E. A. Lawson	972	144	1,116	2
65	,, ..	W. G. Osburne	898	110	1,008	3
53	,, ..	C. Lawson	862	120	982	4
51	,, ..	Moritz Bros.	819	127	946	5
58	,, ..	Miss L. Stewart.. ..	822	123	945	6
61	,, ..	H. Hanbury	800	120	920	7
63	,, ..	Hanslow Bros.	740	122	862	8
68	,, ..	E. W. Hippe	701	131	832	9
59	,, ..	F. G. Silbereisen ..	665	154	819	10
52	,, ..	Myola Poultry Farm ..	691	126	817	11
62	,, ..	A. Greenhalgh	682	134	816	12
70	,, ..	W. H. Robbins ..	685	120	805	13
54	,, ..	G. Carter	683	118	801	14
64	,, ..	E. A. Carne	674	125	799	15
57	,, ..	J. Jackson	642	135	777	16
69	,, ..	C. J. Beatty	630	116	775	17
67	,, ..	Walter M. Bayles ..	629	108	737	18
66	,, ..	S. Brown	445	88	533	19
		Total	14,074	2,376	16,450	
		HEAVY BREEDS.				
		WET MASH.				
77	Black Orpingtons ..	J. McAllan	938	117	1,055	1
89	,, ..	Marville Poultry Farm ..	867	121	988	2
71	,, ..	J. Ogden	872	104	976	3
88	,, ..	H. H. Pump	852	119	971	4
84	Rhode Island Reds	J. Mulgrove	801	109	910	5
81	Black Orpingtons ..	D. Fisher	807	92	899	6
82	,, ..	J. H. Wright	801	90	891	7
76	,, ..	W. P. Eckermann ..	749	102	851	8
87	,, ..	A. Douglas	705	131	836	9
75	,, ..	Fairdeal Poultry Farm	720	110	830	10
74	,, ..	S. Brown	723	87	810	11
72	,, ..	T. W. Coto	689	117	806	12
73	,, ..	J. A. McKinnon ..	681	107	788	13
83	,, ..	Cowan Bros.	633	99	732	14
85	Golden Wyandottes	J. C. Mickelburgh ..	355	51	406	15
78	Red Sussex ..	Jorgen Anderson ..	524	68	592	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	446	94	540	17
86	Buff Wyandottes ..	W. G. Swift	366	39	405	18
		Total	12,729	1,757	14,486	
		DRY MASH.				
100	Black Orpingtons ..	D. Fisher	791	87	878	1
90	,, ..	J. H. Wright	725	94	819	2
98	,, ..	A. Greenhalgh	711	89	800	3
97	,, ..	Jas. McAllan	699	99	798	4
94	,, ..	T. W. Coto	689	76	765	5
91	,, ..	C. E. Graham	638	81	719	6
96	Rhode Island Reds	Myola Poultry Farm ..	691	92	693	7
92	Black Orpingtons ..	Fairdeal Poultry Farm ..	584	90	674	8
93	,, ..	Myola Poultry Farm ..	552	101	653	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	456	74	530	10
95	,, ..	C. L. Hewitt	283	74	357	11
		Total	6,729	957	7,686	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.